CLINICAL GASTROENTEROLOGY

BY THE SAME AUTHOR

THE ESOPHAGUS AND ITS DISEASES

CLINICAL GASTROENTEROLOGY

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CONTENTS

PREFACE

There are roentgenologic gastroenterologists and endoscopic gastroenterologists and biochemical gastroenterologists and physiologic gastroenterologists and some others The most successful and most content is the bedside gastroenterologist because he finds out most about his patients This is a presentation of gastroenterology as a clinical subject intended for the consideration of those whose main interest is bedside medicine Experimental gastroenterology is not discussed Emphasis has been placed after considerable deliberation on those subjects which seem to have special meaning for gastroenterology as it is practiced during the present era although this has necessitated briefer mention of some classical hang on subjects which have been of paramount importance in the past It is not the intent to tell the gastroenterologist how to take a history and accomplish a physical examination or by discussing differential diagnosis how he is expected to think in a clinical situation these are matters for earlier study Eponyms are used freely for the practice of medicine without eponyms is like the practice of law without trial precedents The bibliographies have been kept very brief—woe be to the gastroenterologist whose mind is a bibliography—but the items as listed are considered to be important

Gastroenterology is full of controversial matters In the past it has been the habit paradoxically enough to handle such matters by traditionalizing didactic thinking about them To the author attitudes in gastroenterology are very important and no effort has been made to curb them here No iconoclastics are intended but some stands are taken which reflect the new divergence of thinking currently observable through the whole framework of gastroenterology This does not include a retreat to therapeutic nihilism but it

does among other things, admit freely that we are not doing as well in our understanding and treatment of gastrointestinal diseases as the writings of a less secure era seemed to suggest It seems important to avoid the mistake of assuming that the attitudes and opinions of any generation are synonymous with final answers it is easy for clinical subjects to die if they are permitted to reach the stage of enforced unmalleability Clinical attitudes must reflect this and the following has been written with the thought in mind

In acknowledging the assistance of others I find that those who have helped most have been ward colleagues who were probably unaware at the time of the contributions they were making They have been many but I would like to express grateful appreciation especially to Doctors Irving B Brick J Richard Compton David L Deutsch James T Hardy Maurice H Greenhill Charles R Mueller Norman M Scott Jr Benjamin H Sullivan Jr and Lysle W Williams Miss Phyllis Anderson has furnished the greatest assistance by planning and executing the art work She was aided in this by Mr Alan Hage The photographic illustrations are the skillful work of Mr Roy L Sexton Jr The immense typing burden was graciously borne by Miss Anne McAuliffe and Mrs Pauline Berman Again Miss Nettie Van Duesenbury of Schooley s Mountain New Jersey has generously met the financial obligations incident to preparation of the manuscript To the staff of Paul B Hoeber Inc I express sincere appreciation for constant assistance during what to me has proved a most stimulating experience

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COMPREHENSIVE

GASTROENTEROLOGY

Urology became a science when the cystoscope was born the cardiologist was furnished with something better than auscultation of the heart when the electrocardiograph was devised but gastroenterology has received little help from technologic advances Gastroenterology as a clinical specialty continues to demonstrate that there can be no mechanical substitute for nearness to the patient Every effort to get the gastroenterologic clinician away from the bedside has failed to improve the specialty and there have been many such efforts—biochemical electrical isotopic and others Gastroenterology has not yet reached the peak of its clinical potentialities and it is fair to say that the prerequisite is more general agreement that the patient with gastroenterologic illness can not be measured very well by the laboratory and that the specialty continues to demand total patient evaluation and treatment There is hardly an older concept in medicine nor one which is more often ignored A favorite quotation ascribed to Socrates (470?–399 B C.) is translated thus And this is the reason why the cure of many diseases is unknown to the physicians of Hellas because they are ignorant of the whole which ought to be studied also for the part can never be well unless the whole is well

The gastroenterologist s responsibility is the patient s problem whatever form it may take and the gastroenterologist s method must be geared to the total problem In particular he must face the emotional problems of each patient in order to obtain sufficient information about the total patient illness to provide effective therapy Gastroenterologic disease more than any other is governed by the emotions As often as the emotional aspect is spoken of the tendency often is to mention it for its mentioning only and then to proceed

latter to communicate to himself the nature of his basic problem Usually he has not only been unable to define it consciously but he has no appreciation of its potential effects He does not understand that inability to adjust to separations in the environment can be just as disabling as a cancer Furthermore it is difficult for the average patient to understand that it is not the threatening situation but his own reaction to the situation that can make him sick Adjustment is the basic factor and this is hard for the patient to perceive It is a mistake for the doctor to focus on the bad situations that might surround a patient As far as health is concerned it does not matter much whether the patient has great financial troubles or a recent bereavement or an unfaithful wife if he has made proper adjustments Such unfortunate situations too often are called stressful and it is sometimes said that the patient s symptoms cannot have a functional basis without them This is a trap that the doctor must avoid in all his dealings with patients The cogent matter for evaluation is the patient s reaction to the situations in which he finds himself whether they seem good or bad to the doctor A situation which might seem to be most fortunate such as inheritance of a large amount of money may be just the factor which is creating stress for the patient and hence a problem in *attaining healthy adjustment*

Goal directed interview technic is the best method by which the gastroenterologist may complete the comprehensive treatment of his patient The same approach is utilized for all patients whatever the symptomatic problem although for some particularly those with ulcerative colitis the doctor must proceed very very slowly Even though the doctor s purpose is not to accept the burden of the problem he must function as an efficient catalyst if the patient is to find ways to solve them for himself There is a great deal more to this than merely exhibiting interest and sympathy The actual method by which interviewing is carried out cannot be described in detail in a discussion limited to gastroenterology but a few principles may be mentioned and in addition the reader is referred to the items in the bibliography which follows

Every contact that the patient has with his doctor s establishment must be oriented towards adjustment to comprehensive therapy *It begins at the moment the patient is first* encountered The gastroenterologist is assisted in it by everyone the patient contacts through his office visits or hospital stay—receptionist nurses house staff dietitians and ward attendants All concerned must make it their business to see to it that the organization and functioning of the whole unit is comprehensive in its every intent All must be untiring students of the art of practicing proper interpersonal relations and it is the doctor s job to see that they do

The doctor while studying and treating any organic disease which may be present interviews the patient not only at formal appointed times but also at all other brief or chance contacts such as during ward rounds or upon encountering the patient on the street Good interview technic in a sense is a way or habit of behaving towards the patient at all times in such a way that he will be encouraged to discuss his feelings about the emotional areas which are important to his illness The doctor helps the patient find within himself more mature *and more acceptable* ways of dealing with his problem by having him bring out for his own inspection the chronologic association between his symptoms and those situations and events which proved sufficient to engender emotional stress It is interesting and of course very important to the psychodynamics of the problem that even the most obvious chronologic associations seldom have impressed the patient with their symptomatic significance

Interview therapy is not mere mental catharsis or emotional release through verbalization because it has a specific goal limited in its scope only by whatever practical considerations may bear on the management of the particular case The goal

with evaluation and therapy without regard for it Perhaps to those who are not psychiatrists by specialty the emotional part of the problem is too vague or too difficult—or too frightening—to attempt to do much about it yet there is no element in gastroenterology which is more often responsible for prolonging patient misery than failure of both doctor and patient to accept the basic importance of emotional factors in controlling illness When it is said that 80 per cent of the gastroenterologist s practice is devoted to patients with functional disease it is often meant that following study of all patients for organic disease some organic defect can be found in only 20 per cent This implies an important error in thinking the failure to recognize that 100 per cent of sick people have functional problems and that 20 per cent have in addition organic disease as either the cause the result or an incidental facet of their problem The art and science of managing together both the emotional and organic aspects as a psychovisceral complex are comprehensive gastroenterology

It is permissible to define gastroenterologic disease only in terms of its effect on the patient not in terms of its appearance to the pathologist No one understands this as well as the patient Upon first encountering a clinical problem the doctor in his automatism is likely to direct his thoughts immediately towards search for a pathologic lesion but this is not what the patient wants nor necessarily needs The patient expects his doctor to provide help for all matters which are disturbing him and often no distinction is or can be made by him between the mental and physical aspects of the problem Because so often the organic disease and its consequences have little to do with what is making the patient sick establishment of an organic diagnosis is likely to prove the least helpful result of the search for the cause of symptoms One patient with carcinoma of the splenic flexure may be as happy as a person can be while another with the same size and type tumor may be miserable Obviously two different total patient problems are involved and resection of the two tumors is not going to furnish a total answer for both Neither patient cares primarily about his lesion which he probably does not understand very well Instead he is somebody with a job to keep a family to maintain and a certain amount of fun to have He looks to his doctor for help when symptoms create trouble anywhere within the framework of his own special sociologic organization The desire for total help may however prove quite occult to the patient himself as well as to the doctor Perhaps he can communicate with his doctor only by talking about his bowel The doctor must keep his awareness mobilized so that by recognizing communication difficulties he can function continuously in the total organization of the patient s illness Appreciation of the fact that there is much going on in addition to tumor growth is the basis for comprehensive gastroenterologic therapy

Treatable organic disease must be treated The emotional problems whether or not they be associated with an organic lesion must be actively treated too for proper total management The gastroenterologist misses the major aim and it can be fairly added the real value of his specialty if he lets himself become disinterested in therapy of the emotional part of his patient s illness Somehow the young clinician whatever his field must from the start find a way to avoid repulsion which comes so naturally of the emotional aspect The threat that the doctor feels usually stems from an automatic assumption that he is supposed to accept the burden of the patient s emotional difficulties just as he is supposed to take out the appendix if it is inflamed If this were true it would of course create an impossible situation for the clinician and a good reason to be repelled But actually the doctor s proper role is quite different his purpose being to see to it that the patient himself finds a way to accept the responsibility for his own problems

The most effective means for doctor and patient to accomplish their purpose is through utilization of a technic which permits the

CHAPTER 2

TONGUE

AND PHARYNX

The mouth and throat sites of some of the most interesting of diseases have been claimed by a relentless series of specialists —the dentists dermatologists hematologists nutritionists otolaryngologists and others Perhaps the gastroenterologist will be excused if he continues to assume part of the responsibility for the tongue and pharynx Whereas all the abnormalities of these regions will be important to him in his practice only certain ones may properly be discussed here

TONGUE

The physician of former times who had to rely to a definitive degree on clinical observation found detailed examination of the tongue to be a profitable pastime He used to say that most diagnoses could be made entirely on the basis of what the tongue could tell and what it could show With certain modifications this is still partly true but not often enough is advantage taken of it The clinical dignity of the tongue has suffered as expected from increasing emphasis on laboratory medicine

The tongue reflects many physiologic states —the degree of body hydration to some vague extent the phases of digestive activity the relaxation of sleep the hypermotility of emotional agitation and variations in peripheral vasomotor activity The tongue also indicates in a general way the state of total health although admittedly it may be difficult to delineate between changes of local origin and those which are manifestations of systemic illness It is well to note parenthetically that in neither case is it particularly important whether or not the filiform papillae gather debris in judging abnormality The systemic disorders which cause gross changes in the appearance of the organ are

as already discussed is to have the patient reveal to himself the influence that emotional factors have been exerting on his total illness The doctor directs the patient s conversation to areas which appear to be emotionally charged while at the same time remaining as inactive in the discussion as is compatible with a productive interview During the recitation of the initial medical history perhaps most of these areas have been made apparent or if the patient is a poor communicator they perhaps will be detected only with the passage of time

This is autotherapy under guidance Usually *it proves easier and very much more* effective than the initiate might suspect As the patient talks to his doctor he answers his own questions and gives up his symptoms This takes time There is no solution to the problem created by the amount of time it requires to practice good gastroenterology Perhaps for the average duodenal ulcer patient about 10 hours of interview therapy *are required Actually the results are so good* when this effort is made at the onset that the patient has in the long run fewer recurrences less disability less chance of complication and in general less time lost because of illness The comprehensive approach is a practical one for this reason

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Actually this makes little difference to the clinician because rarely do single deficiencies occur The classical descriptions of pellagra with its swollen scarlet tongue which is especially susceptible to aphthous ulceration and of ariboflavinosis with its purple denudation and mushrooming filiform papillae must become familiar to all clinicians but their diagnostic usefulness is a bit limited because of their specificity

Histopathologically the progressive stages of chronic glossitis are rather clear-cut If one should make an autopsy study of the matter he may easily become convinced that the several chronic glossitides as they are often designated are actually no more than stages of a single pathologic process The earliest change is hypertrophy of the fungiform papillae of the anterior third of the tongue Later their tips become flattened



Fig 1 Moderate macroglossia in 24 year-old woman *with primary amyloidosis There were no other positive physical findings*

The quantitative aspects of glossitis on the other hand can be signs of major clinical import In the population groups encountered by most gastroenterologists in this country at this time florid nutritional deficiencies are rarely encountered—few are either severely acute or in an advanced chronic phase Fortunately the changes observable in the tongue rather faithfully mirror in their intensity the severity of deficiency and their rapidity of improvement under treatment is sufficient to furnish a useful gauge for estimating the progress of total response

and there is a tendency towards fusion at their base The filiform papillae become abnormal later largely through squamous hyperplasia The final stage is initiated by atrophy of both types of papillae This stage may continue to the point at which the lingual surface is converted to little more than smooth stratified squamous epithelium All of these changes are grossly discernible at physical examination and it behooves the clinician to be on the alert for the signs of progessive chronicity

The atrophic glossitis of hemoglobin de

limited to the mouth occurring as light gray papules distributed in patches or streaks over the lingual dorsum The latter are usually silent but have a rather striking appearance with white eroded centers and bright red halos They may precede development of the skin lesions

PHARYNX

The pharynx is a small region but its normal function from moment to moment is essential to life Not only must its upper portion remain free of obstruction so that flow of air to the laryngeal aditus is unimpeded but also it is responsible for seeing to it that ingestants are guided into the esophagus rather than into the respiratory tract

DEGLUTITION

If the normal pharynx has a special characteristic it is that of an astounding complexity of neuromuscular coordinations Although relatively few muscles actually surround the pharynx a great many neighboring ones supplement its activities and different segments of its own muscles function from independent stimuli The act of swallowing is something of a highlight among the body s muscular mechanics It is all initiated by backward *propulsion of the bolus by the tongue with* stimulation of Pommerenke s areas the sensitive pharyngeal spots which are responsible for setting into motion the pharyngeal deglutitory activities The trigger areas are supplied largely by the glossopharyngeal nerves with help from the second branches of the trigemini and the superior laryngeal nerves The motor supply to the six pharyngeal muscles comes from the glossopharyngeals accessory nerve branches from the pharyngeal plexus and branches of the external laryngeal and recurrent nerves As the bolus enters the hypopharynx the larynx trachea pharyngeal walls and upper esophagus make a sudden upward movement Both the hyoid bone and larynx move forward as well as upward opening the pharyngeal lumen The base of the tongue which similarly has migrated anteriorly then returns towards the posterior pharyngeal wall The epiglottis which was tipped over backward to empty the valleculae in a divided stream around the laryngeal aditus slowly resumes an upright position As the hypopharyngeal walls descend again they contract above the bolus the cricopharyngeus muscle relaxes and the bolus is passed quickly into the esophagus

Diseases of the hypopharynx manifest themselves to a large extent by disordered deglutition The symptom common to most is difficult or painful swallowing whether the disease be mechanical neurologic infectious tumorous or emotional

GLOBUS HYSTERICUS

This is the common symptom of lump in the throat and it always indicates a response to some emotional stimulus The trouble is that all lumps in the throat are not globus hystericus Cancer can cause the patient to describe the same feeling Although to the doctor the term implies a very specific sensation with a very specific etiologic significance the patient is not practiced in describing abnormal feelings He who diagnoses globus hystericus assumes heavy responsibility Even in the overtly neurotic patient the complaint should be labeled globus hyster*icus only after roentgenologic and endoscopic* examinations have revealed normal structures

The sensation appears to be a paresthesia Lump in the throat describes it well enough It may be felt briefly by the most stable of people particularly youngsters during any sincere emotional response to grief When it is prolonged or recurrent over long periods in the absence of recognized sadness which calls for overt emotional response it is abnormal

NEUROLOGIC DISEASES

Several neurologic diseases may disturb the functions of the pharyngeal muscles The re*sult is incoordination of deglutition* The danger is not that of eventual undernutrition but of transaditai aspiration and acute or chronic pulmonary disease

Quickly tiring deglutition is the first symptom of myasthenia gravis in about 20 per cent of cases The patient develops a characteristic habit of tilting his head backward to help empty the valleculae and thus assist swallowing by gravity Dysphagia occurs in approximately 30 per cent of patients with occurs during grand mal seizures Cerebral hemorrhage and thrombosis may alter pharyngeal reflexes enough to make purposeful swallowing impossible Any disease which destroys the central nuclei or immediate peripheral tracts of the vagus and accessory nerves causes paralysis of parts of the pharyn

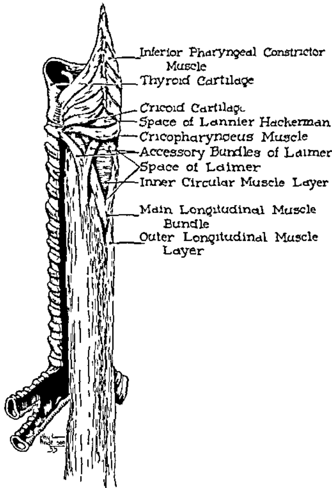


FIG 4 The muscles of the posterior aspect of the pharyngoesophageal junction

cerebellopontine angle tumor In bulbar poliomyelitis the problems of incoordinate hypopharyngeal activity and aspiration of saliva constitute a particular hazard during the patient s sojourn in the respirator There may be disturbing pharyngeal hyperactivity in Sydenham s chorea and parkinsonism while tetanus and rabies are frequently attended by periodic pharyngospasm Perhaps the same geal musculature (syndrome of Avellis) Disturbed deglutition is common during diphtheria and in considering therapy it is well to keep in mind that nerve involvement rather than the pharyngitis itself is at fault

DIVERTICULA

The walls of the hypopharynx are subject to considerable physiologic strain due to the

rapidly changing intraluminal pressures of swallowing plus the special restrictions of the firm larynx in front and hard spine behind Whether or not these factors are actually important etiologically the hypopharynx a small region seems unusually prone to diverticulum development The posterior hypopharyngeal diverticulum of Zenker is by far the commonest of these Anterior and lateral hypopharyngeal diverticula are extremely rare The diverticulum of Killian is an uncommon posterior pouch which develops superior to the orad termination of the gastrointestinal tract s muscularis mucosae at the upper edge of the inferior pharyngeal constrictor muscle Accurate diagnosis depends entirely on roentgenologic study

The classical local symptoms of hypopharyngeal diverticula are progressive dysphagia gurgling sounds during swallowing periodic gagging and regurgitation of undigested food nocturnal choking and at times weight loss Subjectively these may be very annoying symptoms but of much more serious consequence to the patient is the possibility of periodic transadital nocturnal aspiration of diverticular contents with development of chronic pulmonary infection—recurrent pneumonia bronchiectasis chronic bronchitis pulmonary fibrosis and lung abscess Radiologic examination of the pharynx and esophagus should be considered an essential study for every patient with chronic pulmonary disease

Zenker s diverticulum is largely a disease of men in a proportion of four to one About three quarters of the patients are more than 50 years of age at the time the lesion is first detected The sac pushes out through the space of Lannier Hackerman (Fig 4) which separates posteriorly the main portion of the inferior pharyngeal constrictor muscle from its caudad segment the cricopharyngeus muscle Muscularly this is a weak area but good posterior support is furnished by the spine Consequently as the sac grows its fundus must drop inferiorly in a direction governed by the path of least resistance and by gravity (Fig 5) It dissects downward between the prevertebral fascia and the post esophageal septum of the deep cervical fascia There is a tendency for it to lie a little to

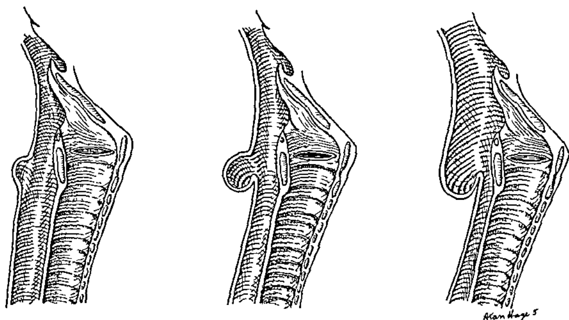


FIG 5 Sagittal sections through hypopharynx and larynx showing progressive stages in the development of Zenker s diverticulum The sac eventually comes to lie in the axis of the pharynx having rotated the esophageal orifice anteriorly

the left of midline as a pyriform sac Occasionally a bilobed configuration develops (Fig 6) When the diverticulum reaches a length of a few centimeters the weight of its contents and the direction of its growth begin to produce rotation of the distal hypopharynx The esophageal orifice is swung anteriorly and eventually the diverticular lumen comes to lie in line with the axis of the pharynx



FIG 6 Zenker s diverticulum retaining barium suspension following a swallow This is the bilobed variety which is less common than the simple pyriform sac

Then anything which is swallowed whether it be food or a diagnostic instrument must head first towards the diverticulum rather than the esophageal lumen The important consequences are subjectively an important degree of dysphagia and objectively the certainty of perforation if blind transoral instrumentation should be attempted The sac may grow large enough to accommodate a quart or more of stagnant liquid Before it attains this size it will have caused compression of the esophagus displacement of thoracic structures and hoarseness secondary to pressure upon the recurrent laryngeal nerves

Treatment of hypopharyngeal diverticula is surgical amputation The most pressing indication is chronic pulmonary infection The severity of the patient s swallowing disability need not be evaluated too critically in deciding when to operate because one can be sure that if the patient is having trouble now untreated he will have more trouble later For Zenker s diverticulum the surgeon uses the left presternomastoid approach Today a one stage procedure is almost always used The precise line of amputation must be selected with care so that closure of the hypopharyngeal wall will neither produce pharyngeal narrowing nor leave enough laxness to encourage recurrence of a diverticulum

MUCOSAL DISEASE

The pharyngeal mucosa seems well able to withstand its normal vigorous mechanical activities but it is nevertheless rather susceptible to the types of infection which accompany debility such as aphthous ulceration and candidiasis and to the common specific infectious diseases which involve the upper respiratory tract In addition there is a primary form of acute hypopharyngitis which is characterized by multiple superficial ulcerations exudation and mucosal hyperemia and edema This is not a well understood process but the occurrence of inclusion bodies in biopsy specimens removed from the ulcer edges suggests that there may primarily be a virus at work Oral bismuth subcarbonate paste seems to help but periodic recurrence is common

Several *systemic diseases* may affect the pharyngeal mucosa although not often do local symptoms result The characteristic collagen changes of scleroderma occasionally involve the hypopharynx Erythema multiforme a manifestation of many disease processes may begin in the mouth and pharynx and extend up into the nasal mucosa In these regions the lesions appear as vesicles flaccid bullae and gray erosions with erythematous borders Pemphigus which extends

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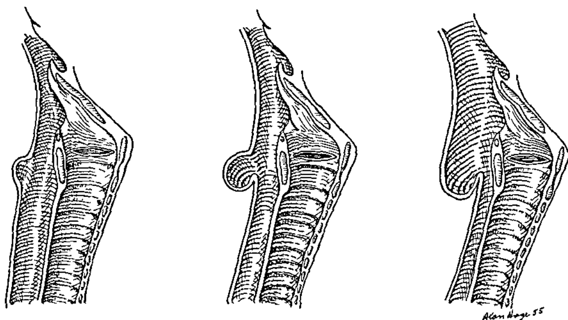


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finger is important if a tumor is found because it may supply information about the lesion's limits which is not evident upon inspection (Fig 7)

Search for metastases is most profitably made in the neck area The usual node groups affected are the retropharyngeal parapharyngeal sublingual deep cervical chains and carotid chains Direct extension to the larynx



Fig 7 Carcinoma of the right side of the hypopharynx showing pressure against the laryngeal orifice at the time of autopsy The tumor was first detected by palpation with the finger following cervical node biopsy which showed metastatic squamous cell carcinoma

is common but progression down into the esophagus is not By the time diagnosis is established it may be found that there has been infiltration of the cervical muscle groups cervical vertebrae thyroid gland tongue tonsils trachea large cervical vessels and skin At autopsy about 20 per cent of the cases show metastases in the lungs the commonest location for distant spread Liver and bone come next Metastasis to other organs is rare but the best possibilities are kidneys spleen myocardium and brain

The majority of hypopharyngeal cancers are best treated by radiation therapy There is enough radiosensitivity to assure some improvement although not enough to permit cure In certain cases thorough clinical evaluation may suggest that there has been little metastatic activity and then surgical extirpation may be elected This involves a very radical operative procedure the Wookey operation or a variety thereof Whether it is a reasonable operation cannot yet be evaluated because it has too recently been introduced It must offer a fair hope of cure before it can be generally accepted for it involves block removal of the hypopharynx larynx and the upper portions of the trachea and esophagus

EXTRINSIC DISEASES

Although the posterior pharyngeal wall is in close apposition with the spine it is uncommon for *vertebral exostoses* to produce

into the mouth and throat is dangerous because of the possibility of obstruction of the aditus The xanthomas of biliary cirrhosis and of idiopathic hyperlipemia occasionally can be found in the pharynx in patients who have extensive skin involvement Hemorrhagic diseases commonly are accompanied by pharyngeal ecchymoses and free bleeding In untreated pernicious anemia and the sideropenic anemias including Plummer Vinson syndrome the epithelium becomes atrophic There may be a degree of atrophy in any chronic disease accompanied by undernutrition including senility pulmonary tuberculosis and multiple avitaminoses

Sjogren s syndrome is a complex epithelial disease of unknown etiology manifested by dry mouth and throat keratoconjunctivitis sicca parotid swelling painful tongue fissured lips and depressed lacrimal function It is often associated with chronic systemic infection arthritis iron deficiency anemia *achlorhydria multiple avitaminoses or the* menopause but efforts to prove causal associations have regularly been unsuccessful Mucosal atrophy and dryness are always found in the mouth and pharynx and often there is atrophy of the gastric bronchial and vaginal mucosa Although the esophagus is similarly affected and may be eroded in addition the dysphagia of Sjogren s syndrome is due to oral dryness No effective therapy is known

A *web* is a thin perforated sheet of tissue which extends across the hypopharyngeal or esophageal lumen sometimes composed of net like strands sometimes merely taking the form of a semilunar shelf around a portion of the circumference Only the mucosa s epithelium is included so that microscopic examination reveals merely squamous epithelial cells and a small amount of stroma Webs may *develop in the hypopharynx in response* to any mucosal disease particularly one which leads to epithelial atrophy They may be congenital too and sometimes they seem for no reason to form in adults who otherwise appear to be healthy Study of the cervical spine in such cases may suggest that irritation of the pharyngeal wall by vertebral exostoses is at fault Dysphagia of course is the patient s complaint The diagnosis can be proven only endoscopically Treatment is simple being accomplished either by dilatation or by trans esophagoscopic rupture depending on the configuration of the web s foramen

CANCER

Cancer of the hypopharynx has certain characteristics which distinguish it from cancer of the buccal cavity and cancer of the esophagus This regional specificity of histologically similar tumors has tremendous theoretic as well as clinical importance, although the former cannot be maturely interpreted at this stage of our knowledge There is a slight preponderance of women among patients with primary hypopharyngeal carcinoma although men predominate in at least a four to one ratio in carcinoma of the mouth and of the esophagus Malignant tumors of *the hypopharynx and base of the tongue are* poorly differentiated almost never demonstrating pearl body formation or significant keratinization Their spread tends to remain restricted to the cervical area until late in the course They are moderately radiosensitive

The occult clinical behavior of hypopharyngeal cancer is largely responsible for the extremely poor prognosis One might think that even a small foreign mass in this restricted physiologically active region would quickly draw attention to itself but this is not so The tumor is not visible to the patient or his friends and there are no early local symptoms It is characteristically silent until spread has gone far In fact a metastatic lump at the side of the neck is the first manifestation in about 30 per cent of the patients Rarely is bleeding an early event Pain develops late as does hoarseness

Diagnosis usually comes as a surprise while following up biopsy discovery of cervical node metastases Inspection by laryngeal mirror is helpful but not sufficient in itself to exclude tumor Direct pharyngoscopy permits positive evaluation of the region plus biopsy and the technic is simple Palpation with the

CHAPTER 3

ESOPHAGUS

INTRODUCTION

Physiologically the esophagus is the least active part of the gastrointestinal tract and anatomically it is the simplest There are few organs however upon which a person depends more for health and comfortable living Except as a repository for foreign bodies the esophagus did not arouse a great deal of medical interest until advances in anesthetic and surgical technology permitted definitive treatment for some of its diseases It was then found that understanding of esophageal physiology and pathology had lagged far behind technical potentialities Just as important it became evident that esophageal diseases had become the property of so many subspecialists—otolaryngologists endoscopists thoracic surgeons chest physicians and gastroenterologists—that esophagology had become rather impotent through dilution Only recently has primary responsibility for the esophagus and its diseases been assumed by the gastroenterologist and a heavy one it is

PHYSICAL EXAMINATION

The esophagus is almost wholly neglected at the time of physical examination but it should not be Although the organ can be studied in accurate detail by roentgenologic and esophagoscopic technics disease must be suspected before the virtues of these procedures can be realized It is the responsibility of the gastroenterologist to find the physical signs when symptomless disease is present This is possible in some instances by auscultation of the swallowing sounds When a liquid is swallowed it falls by gravity to the ampulla and some runs into the stomach This may occasionally produce an unimportant sound the first sound (Durchspritzgerausch) The ampulla retains some water and this is not emptied until the primary esophageal peri

significant symptoms even though they may protrude rather surprising distances Occasionally there is dysphagia either because of simple pressure (Fig 18) or because of secondary hypopharyngeal web formation An interesting peculiarity of the dysphagia is its periodic fluctuations of severity in spite of the static nature of the cause If the clinical situation warrants the bony prominences may be removed surgically

A *retropharyngeal abscess* is one which develops between the prevertebral fascia and the fascia of the constrictor muscles Lateral spread is limited by fascial fusions at the transverse processes of the cervical vertebrae Most cases originate through suppuration of retropharyngeal lymph nodes but trauma either by instrumentation or by a blow against some such dangerous intraoral object as a lollypop stick is responsible for a significant number of cases Dysphagia and disturbances of phonation are the first complaints Inspiratory dyspnea may quickly supervene The diagnosis is ordinarily evident after inspection and palpation of the posterior pharyngeal wall Radiologic study is important for determining the extent of soft tissue swelling Treatment is a matter of skillful surgical drainage with intensive antimicrobial therapy

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troscope is *simply an open rigid tube fitted* with a telescope In addition to its main function of permitting inspection of the esophagus certain manipulations can be carried out through it both to assist diagnosis as by removal of biopsy specimens and to carry out treatment as by dilatation of strictures and sclerosis of varices Biopsy specimens should as a rule be taken of every lesion encountered exceptions being the close proximity of varices suspicion of a vascular tumor and similar circumstances There is a small risk involved but failure to take a tissue specimen may be cause for failure to carry out optimum therapy When a small lesion is found esophagoscopically following normal roentgenologic examination it often helps the roentgenologist in locating the suspicious area on repeat study if the esophagoscopist clamps a silver brain-clip to it The clip which is attached with forceps becomes detached and passes on in a short while but meanwhile the roentgenologist can make a critical evaluation of the area

Except under emergency circumstances fluoroscopic examination of the pharynx and esophagus must precede peroral endoscopy The esophagoscope may be passed through the pharynx and cricopharyngeus muscle under direct vision or it may be passed blindly to a point just beyond the cricopharyngeus with the help of a flexible obturator Rather regularly in the adult the distance from the alveolar ridge to the cricopharyngeus *muscle is 15 cm and from the* cricopharyngeus to the esophagogastric junction 25 cm Every part of the esophageal wall to the gastroesophageal junction and the proximal couple of centimeters of the gastric mucosa can ordinarily be inspected with ease Sometimes the esophageal bend just above the diaphragm cannot be transgressed With the help of telescopic magnification configurational and color abnormalities can be seen which are not detectable by roentgenologic examination If the patient is given 10 ml of 10 per cent fluorescein to drink immediately prior to the examination mucosal erosions which otherwise would be easily overlooked can be readily visualized

Esophageal *tubes and bougies are usually* graded according to diameter by the French system whereby each French unit represents one third millimeter Thus a #30 Fr bougie is 10 mm in diameter

NEUROMUSCULAR ABNORMALITIES

The normal esophagus does not do much throughout its existence except carry out complex highly coordinate muscular activities Nonorganic disease of the organ manifests itself by discordant muscular activity and the symptoms of many of its organic diseases are due not to the lesion itself but to secondary muscle irritability spasm and incoordination These abnormal activities may cause symptoms both during swallowing and when the esophagus appears to be at rest *Odynophagia* means pain on swallowing and *dysphagia* means difficult swallowing Neither necessarily indicates that the wall of the esophagus has an organic disease or that there is obstruction of the lumen

Pyrosis or heartburn is the sensation of rising substernal burning discomfort It is produced by discordant muscle activity at the distal portion of the esophagus It is not due to reflux of acid gastric juice and in fact it is not uncommon in patients with permanent achlorhydria In many people pyrosis can be initiated by passage of a large-calibre gastric tube It can be briefly eradicated by a drink of any liquid including dilute hydrochloric acid probably because the primary *esophageal peristaltic wave temporarily eliminates* simple esophageal spasm Pyrosis is a common complaint among patients with various types of esophageal and abdominal disease

Gastroesophageal reflux appears to be part of normal physiology It has little to do with incompetence of the sphincter mechanism at the cardia From time to time small amounts of gastric contents are ejected briefly into the lower part of the esophagus only to return immediately to the stomach This is a common observation at fluoroscopy The patient is not aware of any sensation at the time and the gastric juice does not injure the esophageal mucosa

staltic wave reaches the distal end of the organ and activates ampullary emptying Then its air and liquid contents are squirted into the stomach sac producing the swallowing sound (Durchpressgerausch)

The esophagus is examined by timing the interval between initiation of deglutition as marked by sudden elevation of the larynx and the sound which indicates that the esophageal ampulla is emptying Lukewarm water is used and the patient takes one swallow for each measurement The stethoscope bell is placed to the left of the xiphoid process When a normal person is in the upright position the second sound is audible following about two thirds of the swallows It is heard about seven seconds after laryngeal elevation with variations of two or three sounds The average of several measurements is used for recording the results

This is then a measure of the swallowing time It permits detection of a lesion diffuse or localized which either causes obstruction or interferes with esophageal motility Its purpose is to detect the presence of disease not to diagnose it Its special virtue lies in its nonspecificity and all inclusiveness Persistent absence or persistent prolongation of the swallowing sounds is reason to examine the esophagus roentgenologically

ROENTGENOLOGIC AND ESOPHAGOSCOPIC EXAMINATION

There is no gastrointestinal organ which can be as easily and thoroughly examined for disease as the esophagus Roentgenologic and endoscopic technics which have strictly complementary diagnostic roles can reach all areas Some diseases can be found and diagnosed only by one method some only by the other and some by both Not many can escape both

Roentgenologic examination calls for study of both intrinsic configuration and motility features and in addition it is important that the relationships of other mediastinal structures to the esophagus be noted with care As the only easily opacified structure in the mediastinum the esophagus furnishes a convenient track for investigation of mediastinal tumors and certain abnormalities of the heart and great vessels The patient is examined mainly in the horizontal position but both Trendelenburgs and Fowlers positions are also important for study of the closing mechanisms at either end of the esophagus Information regarding mucosal pattern and intrinsic disease can be properly obtained only if both a thin barium suspension and heavy barium paste are used for the contrast medium Study of infants and patients with an obstructive lesion calls for use of a water soluble iodinated compound such as diodrast although it has a very unpleasant taste Transpharyngeal intubation is often best in the case of infants When a radiolucent esophageal foreign body is suspected fluoroscopy following administration of a barium filled capsule or barium soaked cotton pledget gives information regarding the site of lodgment without interfering with imminent esophagoscopic visualization

The gastroenterologists adoption of medical esophagoscopy as his own procedure is a natural sequel to his development of gastroscopy In many endoscopic clinics it is the habit to examine both esophagus and stomach as one procedure whenever disease is suspected in either just as anoscopy is part of the procedure of sigmoidoscopy It must be emphasized that the technic of esophagoscopy and other peroral manipulations can be learned only under close personal aegis of an experienced endoscopist There are a great many points in the procedures which must be observed and practiced over and over again before one should actually attempt esophagoscopy In the endoscopy clinic it is found that esophagoscopy is a much safer procedure than its reputation suggests yet the potential hazards for the tyro are very great As important as it is to learn the technic under close supervision it is even more important that interpretations be checked for a long time by an experienced observer Interpretation is much more difficult than passage of the instrument and the instrument itself is not as dangerous to the patient as is the faulty interpretation

The esophagoscope as opposed to the gas

shows a lifeless cylindrical atony without dilatation and without physiologic obstruction

ACHALASIA

Achalasia is a neuromuscular disease of the esophagus as a whole characterized by primary failure of intimate neurologic control The esophagus loses its muscular tone ability to propel its contents and means of carrying out coordinate peristalsis It is important to note that achalasia is not a disease of the cardia There is no obstruction or increase over normal physiologic tone here The cardia is merely unable to relax beyond its resting tone because it receives no stimulating primary peristaltic wave from above It opens easily before the esophagoscope however and the hydrostatic pressure exerted by about eight inches of barium suspension within the esophagus is enough to overcome its muscle tone and to permit some of the suspension to escape into the stomach This segment would be able to function satisfactorily if the muscle of the more proximal esophagus had an intact intramural nervous supply The primary fault lies in ineffective control by Auerbach s myenteric plexus up through the body of the organ Histopathologically degeneration of Auerbach s ganglion cells is the important abnormality The cause of degeneration is unknown



FIG 8 Typical appearance of achalasia in lateral projection as studied by contrast fluoroscopy Note height of barium column and dilatation extending throughout upper portion of esophagus

The atonic body of the esophagus gradually *dilates throughout its length* attaining a diameter and capacity far beyond those encountered in any disease accompanied by actual obstruction at the cardia (Fig 8)

Curling of the esophagus refers to multiple segmental spasms which give to the organ a string of beads configuration when it is examined roentgenologically (Fig 100) The spasms may migrate or remain stationary until eradicated briefly by the peristalsis of swallowing This is an abnormality which is usually encountered in old men but is rare among young people It has no symptomatic significance

The normal esophagus lying as it does within a mild vacuum can accept and briefly retain a large amount of air when a person has bad deglutitory habits Much of the air swallowed by habitual air swallowers goes down no farther than the cardia An air swallower may sometimes be heard to belch almost continuously while in the knee chest position

Rumination (merycism) is the process by which large mouthfuls of poorly masticated food are regurgitated resalivated rechewed and reswallowed It is an atavistic habit encountered largely in infants and imbeciles Marvelous tricks can be performed by professional ruminators

Achalasia of the cricopharyngeus muscle is almost always associated with further neurologic disease of the pharynx as discussed in the previous chapter The problem is that the cricopharyngeus which normally is tonically contracted at rest does not relax when a food bolus reaches the hypopharynx Obviously this must result in constant danger of aspiration of the pharyngeal contents into the bronchial tree

CHALASIA

Chalasia or cardio esophageal relaxation refers to anatomic and physiologic incompetence of the circular muscle at the cardia As the esophagus approaches the diaphragmatic hiatus it funnels out without hiatal constriction and joins the stomach as a widely patent tube There are variations in the degree of relaxation chalasia is not a precise abnormality but a tendency in the direction of regional incompetence Rarely a large dose of atropine may cause a cardial sphincter briefly to appear but otherwise no means of control has been found There are congenital and adult forms with quite different clinical implications

Neonatal chalasia is a dangerous condition because it may lead to repeated aspiration pneumonia beginning immediately after birth Usually the infant begins to vomit and choke with or after the first feeding Differentiation from congenital esophageal atresia with fistula is not possible without roentgenologic study A plain film shows no gas in the bowel presumably because swallowed air is not retained in the stomach Upon contrast fluoroscopy the distal esophagus is found to be patulous and the contrast medium flows back and forth between stomach and esophagus without interference by the cardia Fortunately neonatal chalasia is a self limited disease and one can expect with confidence that a functionally competent closing mechanism will develop spontaneously during the first six months of life Meanwhile constant vigilance must be exercised to see to it that the baby is not able to aspirate esophageal contents This is easily accomplished by keeping the baby in a semi upright position at all times The difficulty lies in the amount of care and watchfulness required to carry out the purpose

Adult chalasia is a clinically unimportant but physiologically interesting condition which is encountered in about 3 per cent of people who for any reason come to upper gastrointestinal roentgen examination Most patients are women The degree of dilatation about the cardia is minimal and the main manifestation is free gastroesophageal reflux when the patient is placed in the horizontal position Almost always some other better explanation is found for the symptoms which led to examination It is particularly interesting that pyrosis does not accompany chalasia Secondary pulmonary complications are not a problem in the adult type

Idiopathic atony of the esophagus is a somewhat different disease In addition to cardial incompetence the whole esophagus

to have an anatomically normal esophagus at the initial examination but a few months later a repeat study shows the early roentgenologic signs of achalasia Similarly some patients with advanced achalasia of many years standing maintain their weight and vigor while others whose disease seems no worse quickly lose a great deal of weight and become wholly incapacitated by weakness In addition to variations from patient to patient the clinical course of an individual may show fluctuations from time to time Emotional disturbance appears to be the most potent influence over severity of manifestations Acute upper respiratory or other infection regularly makes symptoms worse In some women pregnancy aggravates

The important symptom is dysphagia and this may appear suddenly Although it is only rarely associated with actual pain there is usually a constant sense of heavy fullness in the middle of the chest The patient is able to tell precisely the point at which obstruction is felt Liquids are not always easier for him to swallow than solids He quickly finds however that large amounts of liquid taken with meals help swallowing presumably by overcoming the critical hydrostatic pressure and causing passive dilatation of the vestibule Occasionally acute obstruction supervenes when a mass of food usually meat becomes impacted at the cardia As the esophagus continues its progressive dilatation regurgitation particularly at night becomes a bothersome symptom Chronic cough is in fact a common initial complaint There is no true vomiting but merely spontaneous partial ejection of the esophageal contents Food taken several days before may be recognized in the material

The main danger of achalasia is bronchial aspiration of regurgitated material Sudden death may occur during sleep and then autopsy may show that a patient who has had the disease for years without complication has for no apparent reason drawn a large amount of material down into his lungs More often there are repeated attacks of pneumonia For some reason the right upper lobe is involved frequently Chronic bronchiectasis is an occasional sequel Lung abscess is rare The patient is often plagued by nocturnal choking and coughing even though he does not develop pulmonary infection Roentgenologic examination of the esophagus in a search for any type of obstructive or retentive esophageal disease including achalasia is an important study for every patient with chronic cough

Physical examination may or may not show evidence of weight loss Mediastinal widening may be detectable upon percussion No swallowing sounds can be heard In the patient whose esophagus is greatly dilated the drinking of a large amount of water in the supine position will sometimes cause a distinct bulging of the right supraclavicular area

OBJECTIVE EVALUATION

Roentgenologic study is the most important part of objective evaluation Chest x ray sometimes shows mediastinal widening or suggests mediastinal tumor or cyst of the right lung No gas bubble is found in the stomach (Fig 10) With contrast fluoroscopy esophageal dilatation atony and food retention are obvious There is usually a degree of lengthening and this may in extreme cases result in an esophagus which is as long as 50 cm Increased length may produce a distinct sigmoid configuration of the distal portion (Fig 11) When the patient is placed in Trendelenburg s position it is found that the dilatation extends right up to the cricopharyngeus muscle The configuration of the distal end of the dilatation must be scrutinized carefully to exclude organic disease An even tapered narrowing which ends at the vestibule is always found in achalasia The narrow area which opens again at the brink of the stomach s sac varies from 1 5 to 4 5 cm in length The length of the taper is increased by deep inspiration

Esophagoscopic examination is important for two reasons When dilatation is not excessive the possibility that carcinoma may be responsible for the tapering obstruction must necessarily be of concern Furthermore carcinoma occasionally develops in the distal part

With dilatation there is esophageal elongation so that the enlarged organ may eventually assume a sigmoid form The capacity may reach 2000 ml or more

The narrow area begins at the gastroesophageal vestibule (Fig 25) which is largely stomach as judged by the position of the line marking the esophagogastric epithelial junction (Fig 9) Precise anatomic definitions are important here because the pathophysiologic features of achalasia correspond closely to them If the vagus nerves are stimulated at the time of myotomy for early or mild achalasia the body of the esophagus contracts but the vestibule or gastric part of the cardial segment dilates Atypical achalasia is in fact an occasional complication of transthoracic vagotomy The body of the esophagus and the gastroesophageal vestibule react inversely also to pharmacologically applied cholinergic stimuli when autonomic imbalance exists as it does in achalasia The whole region is particularly sensitive to mecholyl in achalasia and this is the basis for the Kramer Ingelfinger test to confirm the existence of autonomic imbalance A dose of mecholyl administered under fluoroscopic control causes relaxation of the vestibule and contraction of the esophageal body if the disease is achalasia

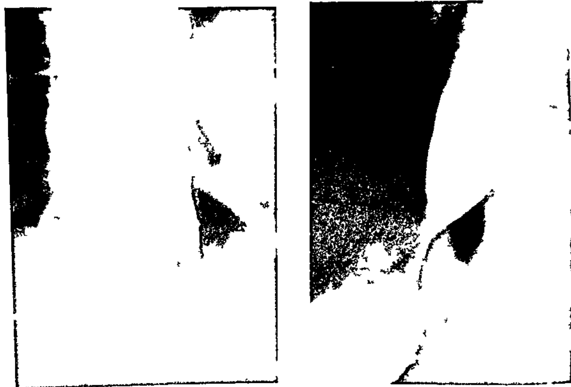


Fig 9 Achalasia showing the configuration of the narrow segment as it appears in the anteroposterior (*left*) and oblique (*right*) projections

CLINICAL FEATURES

Achalasia is encountered in patients of all ages from neonates to the very elderly O casionally it seems that inception of the disease has awaited advanced age but in the majority of cases symptoms begin during the third or fourth decade The sexes are equally affected There may be geographic variation in incidence but data on this are yet inconclusive

The symptomatic picture of achalasia is remarkable in its inconsistencies Sometimes a hugely dilated esophagus is encountered upon routine chest x ray of a person who has no esophageal complaints at all At other times a person who complains of dysphagia is found

weeks or months has been witnessed following each procedure that has given good immediate results The problem is of course that there is no way to encourage the *esophageal musculature to regain its function* and consequently treatment must be aimed at the most normal segment that of the vestibule *Because the segment cannot relax on its own* its circular muscle must be avulsed or otherwise destroyed This permits esophageal contents to drain into the stomach it also permits gastric contents to drain into the esophagus The body of the esophagus does not regain its normal size or configuration

There are two types of drugs which may help some patients for a brief time parenteral nitrites and local mucosal anesthetics *Unfortunately tolerance is developed to both* Antispasmodic preparations of the type commonly used in gastroenterologic practice are of no benefit The nitrites however afford *remarkable help for an occasional patient* even though the effects gradually are lost after a few weeks If the esophagus is emptied by aspiration before a meal ingestion of either a piece of bread soaked with 1 per cent procaine solution or a mixture of procaine and hydrophilic gel *will often permit a meal*



FIG 11 Achalasia with prominent lengthening of esophagus and sigmoid configuration

of the esophagus in bona fide achalasia The cardia must be inspected and perhaps a biopsy taken before therapeutic bouginage is attempted Secondly it is important to study the esophageal mucosa for evidence of the esophagitis of stagnation Esophagoscopic and mural folding often interfere with efforts to find the passage into the stomach

TREATMENT

Treatment is difficult and the results are often unsatisfactory It is unfortunate that re

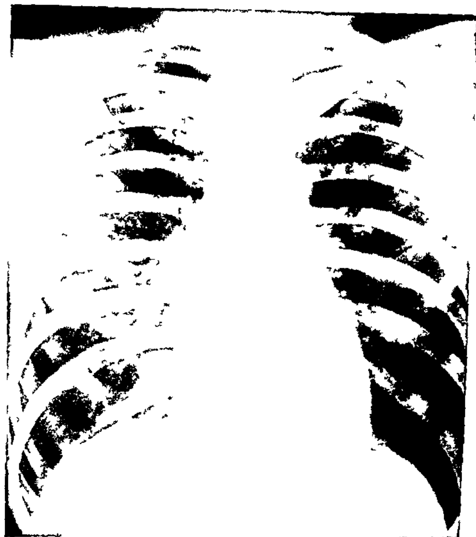


FIG 10 Routine chest x ray showing the two features which suggest the presence of achalasia smooth widening of the right side of the mediastinum and absence of the stomach s gas bubble

visualization is *difficult in this disease* and critical evaluation for esophagitis occasionally is impossible The large amount of retained material must be removed first of course and this requires prolonged gravity drainage with a very large tube plus long-continued lavage During the examination mucosal redundancy

ports of various treatment measures so often reflect an enthusiasm which is born out of immediate posttreatment results There are ways to make the achalasia patient feel better temporarily but no method has been devised which will cure Return of all symptoms and all objective manifestations within

particularly hydramnios and eclampsia is rather common during the pregnancy The infants are frequently premature and more than half have other important congenital anomalies of the gastrointestinal or other systems Atresia is an anomaly which is incompatible with life expected survival being less than a week but within the past several years surgical technics have been developed which permit cure in some cases The anomaly remains a tragic stroke of fate

In the individual case both the seriousness and the possibilities of surgical correction depend on the exact form of the anomaly and there are many variations The esophagus may be entirely absent with or without a vestigial remnant connecting pharynx with stomach Either or both proximal and distal segments of the esophagus may be represented merely by a short blind sac When a sac is present either from the hypopharynx or the stomach it may communicate with the trachea or a bronchus (Fig 12) Occasionally the esophagus is fully developed but communicates with the tracheobronchial tree through a fistula

By far the most common of these variations is that in which the hypopharyngeal pouch ends blindly and the distal pouch originates from the posterior wall of the trachea close to the carina The two pouches usually approach each other within an interval of about 1 5 cm but the gap occasionally amounts to as much as 8 cm It is the tracheal fistula which makes the anomaly so dangerous and the threat is compounded if a second fistula should communicate with the proximal sac But a proximal sac which is blind is dangerous too for laryngeal protective mechanisms are not well developed in the neonate and transadital aspiration is a constant threat The proximal pouch dilates quickly while the distal segment remains of small caliber



Fig 12 Autopsy specimen from case of congenital esophageal atresia and tracheo esophageal fistula The probe is emerging from the gastric segment of the atretic esophagus

to be eaten in comfort a few minutes later

Almost all cases should be managed medically by transoral dilatation There are many technics and intruments for accomplishing this The purpose is to tear the circular muscle of the cardia a potentially dangerous business It does only a little good simply to stretch the muscle now and then because the muscle does not lose tone thereby Quick and wide dilatation is needed This often is attempted with a pneumatic or hydrostatic dilating instrument such as the Plummer Einhorn or Tucker tube The brusquer Starck probang affords a much better chance of permanent avulsion through its instantaneous umbrella like expansion but is correspondingly more dangerous to use Fluoroscopic control is usually necessary for proper placement of the instrument If there is any folding of the esophageal walls the instrument must be passed over a previously swallowed thread Sometimes one dilatation gives considerable help for a time There is usually need for repeated instrumentations The more vigorous each dilatation is the more symptomatic help will be obtained but unfortunately the risk of esophageal rupture increases by that much

Meanwhile the patient must be protected against nocturnal aspiration and esophagitis if present must be treated Both are satisfactorily accomplished by instructing the patient to drink a few glasses of water at each bedtime and then to carry out gravity drainage with the help of a #30 Fr Ewald tube A relatively empty esophagus can usually be obtained thereby if the organ has been thoroughly cleaned out at the start by the doctor Most patients can develop skill at this procedure and they become encouraged to continue through the relief obtained during the night

As unsatisfactory as peroral dilatation may seem to be it usually gives results which are as good as those obtained by operative destruction of the vestibular muscle Again the reason is apparent there is more to achalasia than static contraction at the cardia Unsuccessful surgical treatment is attended by many more problems than unsuccessful manipulative treatment But in a small proportion of patients surgical help must be requested perhaps because an unrelated anatomic problem precludes peroral dilatation or because the esophagus continues to enlarge and pulmonary problems persist in spite of transoral treatment The operation of choice at the moment is the resurrected transthoracic Heller myotomy Many other operative approaches to the problem have been popular in other eras The Heller operation can be expected to help some patients

CARDIOSPASM

Cardiospasm is much rarer than achalasia It is a different disease but it is necessary to note that the two terms are often used synonymously Cardiospasm is due to persistent contraction of the muscle of the cardial orifice beyond its normal resting tone The neuromusculature of the esophageal body remains intact Esophageal dilatation is entirely secondary to the distal spasm and it never becomes very extensive The abnormality can be eradicated temporarily by high spinal anesthesia Achalasia is not affected by this Unlike achalasia there may be spontaneous recovery

Cardiospasm in all cases appears to be a far removed reaction to some other irritative upper abdominal disease Most often gastric ulcer or chronic gallbladder disease seems to be at fault Elimination of the primary lesion is followed almost immediately by clearing of the esophageal abnormality

MECHANICAL ABNORMALITIES

CONGENITAL ATRESIA AND FISTULA

Congenital esophageal atresia with or without abnormal communication with the respiratory tree occurs in about 0 01 per cent of live births males and females being equally affected It indicates faulty development beginning probably during the fifth or sixth week of embryonic life rather than developmental arrest There seems to be no hereditary factor at work but maternal disease

direct esophagoesophagostomy with eradication of any fistulous tract which may be present If the gap between proximal and distal pouches is too great to permit anastomosis reconstruction may be delayed a gastrostomy

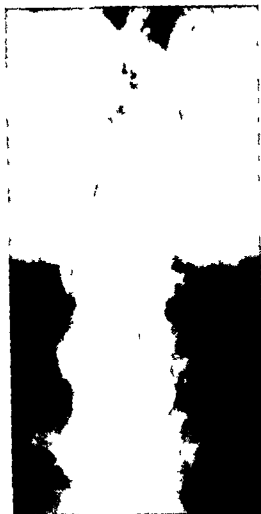


FIG 14 This asymptomatic previously undetected diverticulum prevented passage of a Sengstaken tube in a patient who was bleeding seriously from esophageal varices As the factor interfering with emergency control of hemorrhage the little lesion assumed primary clinical importance

formed and the proximal pouch managed by cervical esophagostomy Either at the time of initial operation or at a subsequent date the stomach may be elevated for esophagogastrostomy or an intrathoracic jejunal or colon transplant may be used to bridge the gap A fistula must of course be closed immediately at all costs

DIVERTICULOSIS

The esophagus is moderately prone to diverticulum formation and any part of its length may be involved All esophageal diverticula are primarily due to the pulsion effect of intraluminal pressure which is secondary to esophageal dyskinesia Extrinsic traction appears to play no part Neuromuscular discordancies of the type which produce curling are believed to be the initial stage Pouches are first ephemeral but with the passage of time they may become permanent Sometimes one or more temporary or functional diverticula may be found in company with a permanent lesion

Esophageal diverticula are classified according to their position The hypopharyngeal types have already been discussed A rare esophageal type is Laimer s diverticulum which forms through the space of Laimer the posterior orad defect in the longitudinal muscle layer of the esophagus (Fig 4) The others may be classified as either midesophageal or epiphrenic

Midesophageal diverticula commonly develop at the level of the pulmonary hili and usually extend to the left and anteriorly (Fig 13) Two or more may be present one above the other They remain small usually less than 2 cm in diameter There is little dependency of the sac s fundus and during fluoroscopy it is observed to fill as the barium bolus passes only to spill its contents quickly again after the bolus Women and men are equally affected In the absence of complications midesophageal diverticula cause no symptoms They are usually encountered by chance during roentgenologic examination

The complications of midesophageal diverticula although uncommon are many and some are dangerous Diverticula interfere with gastric intubation and gastroscopy and they may prevent passage of tamponade equipment in cases of bleeding esophageal varices (Fig 14) Diverticulitis secondary to

Atresia with fistula usually makes its presence known through excess pharyngeal secretions and choking immediately after birth. The secretions quickly reappear after aspiration. Some of the material may arise from the stomach, reaching the throat via the fistula and trachea, so it may contain bile.

With good luck roentgenographic examination may furnish information regarding the anatomy of the anomaly. X-ray studies in this situation are, however, notoriously difficult to interpret. The baby is hard to manage and is in danger of asphyxiation. A fistula may fail to fill with contrast medium because of its small size. The contrast medium may be aspirated via the aditus, simulating a proximal fistula, and it may reach the stomach via the larynx, trachea and fistula, suggesting a *patent esophagus*. For these reasons the surgeon often approaches a case with little specific information about the structures he must deal with. In addition to contrast studies, which are best carried out with diodrast, a plain film of the abdomen may help in diagnosis. If a large amount of air is found in the stomach and bowel, one can assume that a direct communication exists between stomach and air passages.



FIG. 13. Midesophageal diverticulum showing the usual projection to the left and absence of dependency. The esophageal ampulla has been caught in its diastolic phase, not to be confused with hiatus hernia.

Operation becomes an urgent matter as soon as the diagnosis is established. The baby will never be in better general condition than he is at that time. The presence of aspiration pneumonia, for instance, is an urgent indication for, not against, operation. Surgical effort is directed towards primary establishment of esophageal continuity b

Midesophageal diverticula rarely require treatment Because of nutritional interference and pulmonary complications epiphrenic diverticula constitute a threat to health and surgical amputation should be considered in all cases

OTHER MECHANICAL ABNORMALITIES

Other mechanical abnormalities are rare Intussusception and mucosal prolapse are discussed in the next chapter *Dolichoesophagus* is an anomaly characterized by increased esophageal length without dilatation or other abnormality *Megaesophagus* is a vague term implying increased diameter of any etiology In the European literature megaesophagus is often used as a synonym for achalasia

Hypertrophic cricopharyngeal narrowing is an acquired condition which can cause dysphagia either through muscular incoordination or mere muscle mass In an occasional patient the posterior aspect of the cricopharyngeus muscle may be heavy enough to simulate leiomyoma

A *wandering esophagus* is one which at successive fluoroscopic examinations is found to take different courses through the mediastinum It merely has an unusual degree of mobility There is no known clinical significance

Volvulus of the esophagus is extremely rare It can occur only in patients who have both elongation and dilatation of the organ as in achalasia The rotation involves only a relatively short segment of the esophageal body The nature of the initiating force is not known Spontaneous reduction can happen

ESOPHAGITIS AND STRICTURE

The common way for the esophagus to react to local irritations and to those systemic diseases which send noxious influences to it is by diffuse inflammatory infiltration through its mucosa and submucosa Esophagitis is many diseases some being related to each other as stages in a nonspecific progression others being more specifically related to certain infections or humoral influences Esophageal inflammation is a possible first stage or secondary result of most other esophageal diseases It accompanies many acute infectious diseases allergic reactions and poisonings It is indeed a ubiquitous and heterogeneous group of diseases

The esophagitides can be diagnosed only by direct inspection of the esophageal mucosa through esophagoscopic examination Gross appearances of different types may be quite similar and for clinical evaluation study of biopsy specimens offers special advantages Autopsy incidence figures for esophagitis tend to be unreliable because routine histopathologic study is not often made of the esophagus Although the esophageal mucosa is mildly vulnerable to certain agonal and postmortem influences acute and chronic esophagitis which are discovered at autopsy are believed to be of preagonal origin because inflammatory reaction is present Esophagomalacia is a term applied to an entirely different process simple autodigestion of the mucosa which occurs at the end of life usually during the agony

The following is a suggested classification of the esophagitides based on morphologic features and common etiologic factors Specific primary infections of the esophagus such as thrush syphilis and tuberculosis belong in a separate grouping

- I Acute esophagitis
  - A Acute edematous
    - 1 Exogenous due to noxious ingestants
    - 2 Allergic local or part of systemic process
  - B Acute erosive
    - 1 Exogenous due to noxious ingestants
    - 2 Catarrhal associated with nasopharyngitis
    - 3 Systemic part of generalized disease usually infectious
    - 4 Traumatic secondary to esophageal tubes
    - 5 Idiopathic (peptic) including postoperative
  - C Acute pseudomembranous

obstruction of the diverticular orifice is very rare probably because the orifice and neck are usually large Abscess formation with rupture into the mediastinum may occur however and rarely an esophagotracheal fistula or an esophagoesophageal fistula develops A large artery in the region may become eroded, with sudden hemorrhage Because diverticula at this level seldom retain food

Epiphrenic diverticula are notorious for their complications The great threat is regurgitation and nocturnal aspiration with development of acute and chronic pulmonary infection Recurrent pneumonia lung abscess and bronchiectasis are the main problems Carcinoma of the diverticular fundus has been reported a few times Ulceration and bleeding are rare Epiphrenic diverticula in



Fig 15 Small epiphrenic diverticulum shown in air contrast

there is no problem with pulmonary complications

Epiphrenic diverticula spring from the esophagus just above the diaphragm (Fig 15) They are rare particularly among women Most extend anteriorly and to the right They grow slowly retaining a spherical shape and may become very large Most eventually produce symptoms—usually substernal discomfort sometimes dysphagia and often weight loss The amount of disability may be considerable

terfere seriously with transesophageal instrumentations

Diagnosis and evaluation of size and relations of esophageal diverticula are best carried out by contrast roentgenologic study Large epiphrenic diverticula may be mistaken for lung abscess or encapsulated hydropneumothorax on plain chest x ray examination Midesophageal diverticula are unfortunately very difficult to find and examine during esophagoscopic examination but epiphrenic lesions can ordinarily be studied well

to the belief that esophagitis is an intramural disease of the esophagus and that only after local vitality has been depressed can gastric juice exert a corrosive action on the surface. Examination of biopsy specimens shows the picture of primary subepithelial disease with surface erosion which is merely secondary to the underlying process (Fig 16) The lamina propria mucosae is the seat of most of the injury and repair showing heavy diffuse chronic inflammatory exudate varying degrees of fibrosis and edema The inflammation may extend upward into the epithelial layer and where it is heaviest overlying erosion is likely to be found



Fig 16 Biopsy specimen in case of subacute erosive esophagitis Most of the reaction occurs in the lamina propria with areas of inflammation secondarily extending upward into the epithelium

In observing the clinical manifestations of subacute erosive esophagitis one is impressed by the fact that a great variety of symptomatic pictures occur in spite of the unity of the objective findings Coexistence of hiatus hernia does not seem to influence the nature of the complaints to any great extent and one must suppose that the symptoms of hiatus hernia patients are often due to complicating esophagitis rather than to the hernia itself It is clear that many patients with esophagitis have no symptoms at all but of course how often this is so is neither known nor can it be discovered In perhaps 10 per cent of cases the first evidence of trouble is sudden hemorrhage About one quarter of symptomatic patients complain of dysphagia and little else They may feel some discomfort on swallowing but this is due merely to temporary arrest of boli within the distal esophagus Another quarter complain mainly of burning or aching substernal discomfort without painful or difficult swallowing The discomfort often is initiated by a large meal and aggravated by belching Less commonly the symptoms include both dysphagia and odynophagia or painless dysphagia with random episodes of squeezing substernal pain Symptoms are likely to persist without major fluctuation for weeks or months

The only physical finding of significance is abnormal swallowing time Swallowing sounds may be absent or consistently delayed or

1 Primary
2 Secondary (diphtheria scarlatina)
D Acute hemorrhagic (a morphologic category)
E Acute exfoliative
F Acute necrotizing
G Phlegmonous
II Subacute or recurrent erosive or ulcerative
A Of stasis secondary to chronic obstruction
B Traumatic secondary to esophageal tubes
C Neurogenic (Cushing)
D Following cutaneous burns (Curling)
E Idiopathic (peptic)
III Chronic esophagitis
A Fibrotic
1 Stenosing
2 Nonstenosing
B Regional granulomatous
C Follicular (hyperplasia of lymph follicles)
D Cystic (ductal occlusion and gland retention)
E Ulcerative
F Leukoplakia
G Postirradiation

SUBACUTE EROSIVE ESOPHAGITIS

Subacute erosive esophagitis and its acute counterpart are the most common diseases of the esophagus These are the diseases sometimes known as peptic or regurgitant esophagitis but such terms imply definite etiology in a situation which does not yet permit definitive etiologic thinking They can be considered stages in a single pathologic process the main difference being that acute erosive esophagitis sometimes clears instead of entering the subacute stage and consequently does not lead to scarring and stricture Esophagitis of this type being nonspecific may accompany a great many *local* and general diseases but at times it may also act like a primary and isolated process The common diseases *associated with the* subacute form are hiatus hernia duodenal ulcer gastric ulcer pregnancy prolonged vomiting long sojourn of an esophageal tube and postoperative states particularly when esophagogastrostomy has been done Acute erosive esophagitis is often associated with recent general anesthesia cerebral injury craniotomy terminal uremia or an acute infectious disease Approximately 20 per cent of patients with hiatus hernia have esophagitis and 25 per cent of patients with subacute esophagitis have hiatus hernia

The cause for this type of esophageal change remains enigmatic Study and interpretation are made difficult by the fact that the specific nature of the etiologic influence is not the main factor controlling tissue response The tendency has been to assume that activity of regurgitated acid peptic gastric juice has a corrosive effect on the esophageal mucosa and causes it to become inflamed This postulation seems to receive support from the fact that esophagitis is particularly common in patients with hiatus hernia and prolonged vomiting But there are other considerations that suggest that acid peptic corrosion can play no more than a secondary and rather inconsequential role in damaging viable esophageal mucosa All regional tissues which are healthy are imbued with a mechanism which protects them against gastric juice The stomach does not digest itself or neighboring organs Furthermore subacute erosive esophagitis is not uncommonly found in people with achlorhydria as best that condition can be diagnosed and in some reported series as many as one third of esophagitis patients have been found to have achlorhydria Esophagitis is a common complication of stomach operations which are specifically designed to depress gastric secretory activity and total gastrectomy is often followed by the same complication In uremia heavy metal poisoning and septicemia esophagitis which is a common complication can only be *assumed to be secondary to hematogenous* injury Such factors as insufficient protection by surface mucus must necessarily be quite *unimportant in the pathogenesis*

The histopathologic picture of subacute erosive esophagitis adds confirming evidence

gastric ulcer helps and sometimes it does not In either case it is quite apparent that presence of associated disease will frequently make it necessary to carry out esophagitis treatment in conjunction with other therapy The role of emotional factors in the genesis of esophagitis is not understood but it goes without saying that simple interview therapy can play an important part in the success of therapeutic efforts Symptomatic improvement may follow any number of regimens which include special diets antacids and antispasmodics but almost always relief is very temporary Return of symptoms during treatment with these measures is so regularly witnessed that one must assume initial relief was due to iatrogenic enthusiasm or to the natural course of a spontaneously remitting disease It is not believed that there is virtue in dietary or antacid therapy On the other hand use of the mild astringent bismuth subcarbonate has been found by many experienced esophagologists to have merit in treatment of the superficial erosions of esophagitis On the supposition that it does it is recommended for patients with esophagitis particularly those who also have esophageal varices as prophylaxis against variceal hemorrhage until more definitive action can be taken Two grams of bismuth subcarbonate are mixed with water to a paste and taken an hour after each meal and at bedtime Whatever any of these measures may contribute to the patient s comfort one finds upon serial esophagoscopic and biopsy examinations that the objective changes fare no better in the vigorously treated than in the pharmaceutically ignored

Surgical treatment has nothing to offer the patient with uncomplicated esophagitis Operations such as subtotal gastrectomy and partial esophagogastrectomy which have been urged in the past are now known to be able to create esophagitis and are thus contraindicated Simple dilatations with large Hurst bougies often give temporary symptomatic relief and should be considered when the diagnosis is first made For acute hemorrhage from esophagitis pneumatic tamponade with the Sengstaken tube as used for variceal bleeding usually provides satisfactory emergency control

CHRONIC FIBROTIC ESOPHAGITIS AND STRICTURE

Stricture is a common sequel to many types of esophageal injury, being mediated through the marked contracting tendency of chronic fibrotic esophagitis Common etiologic bases are erosive esophagitis especially that which is associated with hiatus hernia and pregnancy corrosive poisoning thermal injury caused by swallowing very hot fluids healing of esophageal ulcers and trauma of retained foreign body or esophageal tube Some mechanical types of esophageal injury always lead to stricture and the most common of these is surgical esophagogastrostomy at the suture line Corrosive poisoning usually does and the others are rather unpredictable The level of injury is of course the level of stricture formation Stricture which follows subacute erosive esophagitis therefore commonly occurs in the distal part of the organ Strictures secondary to foreign body are likely to be high while multiple scattered strictures often result from corrosive damage

Chronic fibrotic esophagitis is always a circumferential disease When inspected esophagoscopically or at autopsy it may be found that more narrowing has developed than the clinical picture suggested The wall in the area is stiff and folds are absent The surface is usually pale and clean Microscopically it is found that there has been stratified fibrous replacement of the muscularis mucosae submucosa and muscularis propria plus heavy infiltration with round cells Frequently when stricture is secondary to esophagogastrostomy there is in addition proliferation of the superficial squamous cells with exfoliation of thick sheets of epithelium from the surface

The principle governing treatment of any stricturing process of the esophagus whatever its etiology is that an esophagus which can be made to function by manipulative management will prove infinitely more satisfactory than any substitute which can be

they may be variable from time to time.

Roentgenologic examination is not helpful for diagnosis of esophagitis but is invaluable for demonstration of associated disease such as hiatus hernia and of certain complications particularly stricture.

Upon esophagoscopic examination it is usually found that the disease process is limited to the lower one third of the organ. All of the esophageal mucosa occasionally is diseased but if there is esophagitis any where the segment of mucosa which joins the gastric mucosa is always involved. The three important endoscopic features are erosions hyperemia and surface exudate (Fig 17). Examination of biopsy specimens is always enlightening.



FIG 17 Esophagoscopic view in subacute erosive esophagitis. The three important endoscopic features are erosions hyperemia and exudate.

The most important and most common complication of subacute erosive esophagitis is hemorrhage. Often the patient has believed himself to be well up to the moment of sudden severe blood loss. Unless esophagoscopic examination is made the source will seldom be suspected. There is no question but that a portion of upper gastrointestinal bleeders whose disease is never identified are patients with erosive esophagitis who have not been examined endoscopically. The cause for bleeding is sudden exfoliation of the superficial layer of the epithelium in many areas cutting across the vessel laden rete pegs.

The second most common complication is esophageal stricture which is discussed in the next section. The relationship between esophagitis and esophageal ulcer is not clear but in some patients both diseases are present in the same segment of the esophagus. Perforation is a rare complication. Rarely chronic pulmonary infection may complicate simple esophagitis presumably because esophageal motor abnormalities may lead to regurgitation and aspiration at night.

There is no satisfactory way to assure eradication of subacute erosive esophagitis. Fortunately in many cases it acts as a self limited disease and in others it remits for long periods. Sometimes treatment of associated disease such as hiatus hernia or

and young adults more familiarly known through lymphoid hyperplasia of the pharynx and rectum

Leukoplakia common in very mild form rarely produces grossly discernible lesions It appears to be the result of chronic esophageal irritation especially that caused by chronic infection in the mouth and throat Other esophageal disease is often present The lesions are composed of hyperplastic stratified squamous epithelium plus deeper chronic inflammatory infiltration Malignant potentialities appear to be insignificant

ESOPHAGEAL ULCER

Primary ulcer of the esophagus sometimes known as peptic ulcer is in some respects analogous to common Cruveilhier ulcer of the stomach and to simple duodenal ulcer Although there are ulcerating processes associated with most types of esophageal disease this is a distinct and well defined category by itself Gastric ulcer is approximately ten times more common

Esophageal ulcer affects the sexes equally unlike ulcer of the duodenum and stomach It develops or makes its presence known either during childhood or during midadult life The relatively high incidence through the first few years of life is believed due to the common association of esophageal ulcer with certain congenital diseases of the cardial region Approximately one quarter of adult patients also have an ulcer in either the stomach or duodenum or both The majority have a hiatus hernia and esophageal ulcer may be considered an important complication of hiatus hernia Patients who have had esophagogastrostomy for whatever reason become especially susceptible to esophageal ulcer Although these situations make it easier for gastric contents to reach the esophagus acid peptic activity is believed to play only a secondary role in ulcer formation

The ulcers occur in almost all cases in the distal portion of the esophagus and most lie just above the esophagogastric mucosal junction It is probable that a portion of esophageal ulcers are actually gastric ulcers which have developed in that portion of the gastric mucosa which normally extends up into the gastroesophageal vestibule The most careful roentgenologic and esophagoscopic study may fail to distinguish between gastric and esophageal localization but biopsy specimens from the caudad edge of the lesion usually permit a precise diagnosis Sometimes the crater extends to both sides of the mucosal junction and then the point of origin cannot be determined Rarely a bona fide primary ulcer develops in the upper third of the esophagus but considerable diagnostic effort including multiple biopsy examinations should be expended before the diagnosis is accepted

The gross appearance of a primary esophageal ulcer as it is inspected *in situ* through the esophagoscope is more complicated than that of a gastric ulcer Part of this is due to esophagitis which usually occurs in the immediate area and part to the large amount of surface exudate which clings to the ulcer base and edges They are not as clear as are gastric ulcers and unless care is taken to flush or wipe the field the size depth and general significance of the lesion may easily be misinterpreted If visualization is not good it is easy too to overlook a second or third ulcer in the area In approximately 10 per cent of the cases there is more than one ulcer When visualized in entirety the crater is found to be ovoid or irregular in outline There is some tendency towards complete encirclement of the distal esophagus forming a girdling lesion The crater floor is irregular and its orad part is usually shallower than the caudad part The caudad edge is often undermined

The symptomatology of esophageal ulcer is such that esophageal disease is usually suspected Pain is the most important complaint It ordinarily is substernal and occasionally radiates to the interscapular region In about half of the patients the pain is brought out by swallowing and fear of pain may lead to fear of eating with quick weight loss In other patients there is no odynophagia but pain is felt a half hour

fashioned surgically Peroral dilatation is the treatment and it is fair to state that if a tube no matter how narrow can be passed through the esophagus successful dilatation *can usually be accomplished Sometimes dila*tation must be continued at intervals for years and never is it without danger nevertheless it is necessary to realize that one of the great blessings of any state of invalidism is the ability to take food and drink by mouth The primary responsibility of the doctor who cares for a patient with an esophageal disease which has stricturing potentialities is to see to it that the esophagus does not become closed off completely Although there are technics for opening a channel through an occluded esophagus occlusion must not be permitted to occur In some patients a stricture may be only 5 mm in diameter when the first symptom of dysphagia appears and at that dysphagia may develop only when a food bolus lodges against it

All strictures must be evaluated esophagoscopically as well as roentgenologically prior to dilatation so that the magnitude of *the job to be done can be fully appreciated at* the outset If of narrow diameter initial dilatation is best begun transesophagoscopically It can then be judged whether further dilatations should be done over an anchored thread or whether it will be safe to proceed blindly In the former case metal dilating olives are usually used Hurst mercury bougies may be satisfactory for blind dilatation but they permit only a rather mild stretching action and if progress is not noted within a few days they should be discarded in favor of olives The danger of dilatation is rupture of the esophageal wall *as will be discussed* The hoary dictum He who lives by the bougie dies by the bougie is more than jest

ESOPHAGEAL WEBS

Esophageal webs like those of the hypopharynx are thin membranous folds composed only of mucosa and fibrosed submucosa They develop in the cervical portion of the organ partly occluding its lumen Distal webs are rare Four out of five patients are women usually in midadult life when symptoms first appear Although congenital webs are occasionally encountered most result from the *healing* of erosions or small traumas Sometimes they develop opposite osteophytes of the lower cervical vertebrae Conditions accompanied by mucosal atrophy such as *pernicious anemia and Plummer Vinson syn*drome seem to predispose to web formation

Webs are common explanations for dysphagia Overflow symptoms during meals may lead to fear of eating and thus to malnutrition Nocturnal aspiration however does not occur Diagnosis is easily established by combined roentgenologic and esophagoscopic examination Treatment is simple One dilatation with a Hurst bougie will eradicate a delicate web A tougher one will respond to several dilatations or it may be bitten out transesophagoscopically with biopsy forceps

LESS COMMON TYPES OF ESOPHAGITIS

Acute edematous esophagitis develops suddenly as a local allergic manifestation either *by itself or accompanied by a systemic allergic* reaction Probably ingestants are most often to blame but inhalants bee stings or drug sensitivities may be the cause It is probable that true cold allergy to ingestants can develop Very hot or strong ingestants may produce transient edematous esophagitis through contact injury

Chronic cystic esophagitis results from occlusion of the duct orifices of the organ s mucous glands Scattered retention cysts form but they quickly disappear apparently through spontaneous rupture There seems *to be no clinical significance*

Regional granulomatous esophagitis a very rare condition appears to be comparable histopathologically to regional enteritis but the few reported cases have been independent of small bowel disease It is an obstructing process which simulates carcinoma

Chronic follicular esophagitis represents esophageal response to systemic mucosal *lymphoid hyperplasia This* is a subclinical autumnal and hiburnal condition of children

ally be overlooked unless esophagoscopic examination is made during the hemorrhage

Whenever an esophageal ulcer heals either by design or spontaneously one common result is formation of a stricture at the area Ulcers account for a large number of strictures Many ulcers will have passed through a series of activations and healings so that a large amount of scar has been deposited

CUSHING AND CURLING EFFECTS

Acute erosive esophagitis subacute erosive esophagitis acute esophageal ulcer and spontaneous esophageal rupture are prominent among the Cushing effects of cerebral injury The same diseases may develop too as Curling effects in patients with severe cutaneous burns but few data are available here

Many foci in and about the brain may upon injury or certain types of stimulation lead to destructive disease of the esophagus stomach and duodenum Particularly potent in this peculiar activity is the hypothalamus especially the tuber cinereum but stimulation of most areas of the cerebral cortex and mesencephalon may at times cause ulceration Presumably the vagus nerves mediate the destructive impulses Diseases and situations most likely to lead to Cushing effects are the immediate postcraniotomy state cerebral trauma hydrocephalus tuberculous meningitis cerebral tumors poliomyelitis the encephalitides and cerebrovascular accidents

The resulting pathologic changes in the upper gastrointestinal tract are characterized by localized ischemic necrosis and more diffuse acute gelatinous softening The distal one third of the esophagus the orad portions of the stomach the antrum and the duodenal bulb are most often affected Sometimes one sometimes all areas are involved One or more rapidly developing ulcers with satellite erosions suddenly appear Sometimes this goes no further than acute or subacute ulcerative esophagitis and erosive gastritis At other times the lesions exhibit quick penetration free perforation and massive peritonitis and mediastinitis At autopsy perhaps only two or three days after craniotomy or trauma local destruction may be found to be very extensive Perforations may be 10 cm in diameter The walls of esophagus and stomach may be gangrenous with multiple perforations

No way is known to halt the destruction When recognized usually through hemorrhage or mediastinitis the process has already progressed far No prophylactic measures are known At the moment death from Cushing effect is a calculated risk of cranial surgery

SPECIFIC INFECTIOUS DISEASES

The esophagus may be directly infected by several of the disease agents which ordinarily exert maximum injury elsewhere in the body In addition it is often injured to a variable extent when systemic infection is present Hematogenous toxic products and pyrexia seem to play a part in this When death is due to such diseases as typhoid fever and influenza the esophageal mucosa at autopsy is often found to be severely affected by hyperemia erosions multiple ulcers ecchymoses exudate and edema

THE ESOPHAGITIS OF INFANTS AND THRUSH

Acute erosive esophagitis is a common autopsy finding among infants and small children and by some pediatricians it is considered a distinct neonatal disease In some cases a Cushing influence seems to be at work secondary either to hydrocephalus or injury at the time of delivery and in these severe hemorrhage or esophageal perforation may occur within a few days of birth In rare instances histopathologic study of the distal portion of the neonatal esophagus indicates that there has probably been bacterial infection of the wall from the time of birth

Esophageal thrush is a disease of both infants and adults but is much more frequent and usually more of a problem in the former Common use of antimicrobial agents has increased the incidence of thrush in all groups This is an infection which requires a debilitated host if it is to make much headway Undernutrition and prematurity are common explanations in the infant and local

or more after meals In either case symptoms are often aggravated by lying down The main manifestation among children is vomiting either with or following meals

Diagnosis is largely the responsibility of the esophagoscopist On physical examination absence or delay of the swallowing sounds is usually encountered Occasionally roentgenologic examination reveals the ulcer but usually the most that repeated studies show is local spasm or mucosal irregularity Because any source of irritation may produce this type of secondary response diagnosis requires demonstration of a crater The string test of Einhorn as described elsewhere may be useful in locating the level of the lesion because most esophageal ulcers leak a little blood Esophagoscopic examination is probably very accurate for detection of ulcers but this cannot be proved because there is no other efficient diagnostic technic with which to compare it

Treatment of esophageal ulcer is difficult in many cases It is important to repair a hiatus hernia if one be present and this perhaps is the most positive step one can take Dietary therapy antacids and antispasmodics have nothing to offer Bismuth subcarbonate on the other hand seems benefical when given as a paste in 2 gm doses an hour after each meal and at bedtime Easy dilatations up to about #42 Fr give symptomatic help presumably because they break up local spasm Not long ago it was thought that the surgical procedures which are used for treatment of duodenal ulcer—subtotal gastrectomy and vagotomy with gastroenterostomy—would prove useful for esophageal ulcer but this has not proved to be so Sometimes because of a history of hemorrhage it seems desirable to resect an ulcer If this is the decision the resection must be made very conservatively without significant shortening of the esophagus and at the same time a hiatus hernia must be repaired if present Often left phrenicectomy and shift of the hiatus to the dome of the diaphragm are necessary to achieve this Partial esophagogastrectomy with destruction of cardial physiology creates the precise conditions which seem most potent in generating esophageal ulcer The effect of emotional disturbances on ulcer in this location is not understood but one may be sure that the patient has problems which require the help of interview therapy

COMPLICATIONS

Ulcers of the esophagus are more likely to develop complications than are those of the duodenum or stomach The complications tend to be severe and it is for this reason especially that one would like to find a satisfactory radical means for eradicating these lesions Perforation often a clinical catastrophe is the most feared complication Usually it is a relatively localized perforation into the mediastinum which has already become locally fibrosed in response to a chronic penetrating process Often however the ulcer is more acute and there is free rupture into the mediastinum followed by fulminating mediastinitis Death may occur in a few hours Less commonly perforation breaks directly into the left pleural cavity aorta or pericardium Perforation into the peritoneum is a clinical oddity Treatment is discussed in the section on rupture

Bleeding is almost as much of a threat Esophageal ulcers may suddenly lead to exsanguination through massive arterial hemorrhage or they may bleed slowly and continuously over long periods In the former case pneumatic tamponade with the Sengstaken tube may successfully control bleeding but because it cannot be relied upon and because determination of the bleeding site depends on esophagoscopic examination it is usually better at the time of esophagoscopy to pack the area with a large amount of oxycel around a Levin tube *Emergency* esophagogastrectomy may on occasion be necessary to save life It goes without saying that the *problem of esophageal ulcer hemorrhage can* not be approached unless an accurate diagnosis of the source of hemorrhage has been *made* Because esophageal ulcer accounts for a very small proportion of upper gastrointestinal hemorrhages the diagnosis will usu

ally be overlooked unless esophagoscopic examination is made during the hemorrhage

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esophageal disease or advanced generalized malignancy usually underlies thrush in the adult *Candida albicans* grows as a slick velvety coating over all or parts of the esophageal mucosa extending and regressing from time to time Its mycelia grow into the epithelium and rarely may penetrate it Epithelial erosions are produced

The clinical picture of neonatal thrush esophagitis is difficult to recognize Almost always there is oral thrush and sudden worsening of the infant s condition may be the only hint that spread has occurred There is refusal to take feedings Vomiting is a prominent feature and there may be hematemesis There is often laryngeal and tracheal involvement and *Candida* septicemia is an occasional complication Even when localized to pharynx and esophagus the infection may produce an intense toxemia often accompanied by hypothermia A common problem is incoordinate deglutition leading to aspiration of feedings and aspiration pneumonia At times neonatal thrush esophagitis can be considered the cause of death rather than a terminal complication

Oral gentian violet in 1 per cent solution is effective in eliminating or at least controlling the oral and esophageal infection in most cases Stilbamidine and hydroxystilbamide seem to show promise of help in serious infections Associated bacterial infection must be assumed to be present and antimicrobial therapy as with penicillin and streptomycin should be used Other important therapeutic problems are created by the underlying cause for chronic sickliness and by secondary nutritional defects Feedings must be given with care because of the danger of aspiration

SCARLET FEVER AND DIPHTHERIA

Among the acute infectious diseases which may damage the esophagus through hematogenous toxic effects scarlet fever is most important Esophagitis is often an important facet of the clinical problem There is focal mucosal necrosis with production of ulcers edema and exudative membrane Perforation seems to be very rare It apparently is due to fulminating transmural progression of a phlegmonous type of streptococcal esophagitis Esophageal stricture is a rare sequel of scarlet fever

Extension of a diphtheritic membrane from the pharynx down into the esophagus is rather unusual When it happens the type of damage produced is the same as it is in the pharynx —surface necrosis ulceration and that contributed by the pseudomembrane itself Esophageal stenosis rarely follows Most of the swallowing difficulty in diphtheria is due, not to the local lesions but to paresis of the swallowing muscles

TUBERCULOSIS

Tuberculosis of the esophagus assumes many forms The organ regularly becomes involved at the time of miliary dissemination and detailed microscopic study of autopsy specimens from patients dead of tuberculosis usually demonstrate that tiny mucosal tubercles have developed These are unimportant to the clinical course and ordinarily no one knows of their presence Dysphagia in the tuberculous patient is much more often due to pharyngeal tuberculosis than to esophageal involvement

Primary tuberculosis of the esophagus has never been proved and almost always gross lesions of the luminal surface develop either through extension from laryngeal or pharyngeal tuberculosis or through superimposition of infection from swallowed material on established esophageal disease Carcinoma and stricture especially that which is secondary to corrosive poisoning are favorite sites for swallowed organisms to settle

The esophagus may become infected by extension from paraesophageal lesions Caseous hilar nodes may rupture through the esophageal wall producing multiple sinuses and sometimes completing an esophagotracheal fistula Tuberculous caries of the lower cervical and upper thoracic vertebrae may rupture anteriorly to produce a periesophageal cold abscess or sinus tract into the esophagus

SYPHILIS

Primary syphilitic infection of the esophagus is a theoretical possibility when an improperly cleaned stomach tube is used but it has not been reported The secondary stage probably occurs rather frequently as it does in the mouth and throat but one ordinarily would not discover its presence here Congenital syphilitic ulcers have been reported a few times

Tertiary syphilis occurs in the form of diffuse intramural infiltrations and of discrete submucosal gummas There are many configurational possibilities governed by ulcerations and scarrings that are produced by the local arteritis The most common result is diffuse constriction which causes tapering stenosis of the lumen Often mucosal ulcerations and leukoplakia are superimposed over the affected area Diagnosis may be very difficult because material obtained by biopsy commonly shows no more than nonspecific tissue reaction Reliance must be placed in the combination of history blood serologic study and of gross roentgenologic and endoscopic pictures The results of specific antisyphilitic therapy are often miraculous with quick clearing of all morphologic abnormality

OTHER INFECTIOUS DISEASES

Several cases of esophageal ulcer which seem to have been of virus origin have been reported The lesions in some were multiple and of variable size The interesting feature was that histopathologic study showed intranuclear inclusion bodies in the neighboring epithelial cells

Sjogren s Behcet s and the several related syndromes which include widespread mucosal disease may be accompanied by erosion of the esophagus This is a poorly explored matter because of sparsity of esophagoscopic reports The dysphagia which some of the patients complain of is of pharyngeal rather than esophageal origin There is no good evidence that these syndromes are infectious in nature but this seemed like a good place to mention them

CORROSION INJURY

A great many materials in the civilized environment are upon ingestion capable of producing corrosion of the upper gastrointestinal tract with or without systemic toxicity As is the case with all noxious agents most people come into contact with esophageal corrosives by accident and only a few use them with suicidal or criminal intent The prophylactic implications are obvious Legal efforts to discourage accidental ingestion of corrosives have been moderately successful in some countries The corrosives that the gastroenterologist must deal with depend on the mores fads availabilities and commercial and household usages in the community in which he practices In this country about 70 per cent of esophageal burns are due to household lye a mixture of sodium hydroxide and sodium carbonates The incidence in the southern states is several times that for the country as a whole Other commonly ingested corrosives are Lysol phenol iodine bichloride of mercury lactic acid and hydrochloric acid Children get into them by accident or mischievousness most adult males mistake them for whiskey or encounter them as adulterants in wines and some women use them for suicidal purposes Approximately 60 per cent of patients are three years old or less and 80 per cent are less than 15 years old at the time of poisoning

The degree and location of corrosive damage depend on several factors As a generality strong alkalies injure the esophagus more than the stomach and strong acids are more dangerous to the stomach All variations are found in relative severity of the local damage as opposed to general toxic effects Lye exerts its injury locally Phenol on the other hand infrequently leads to stricture because a dose large enough to corrode the esophagus usually kills early through systemic toxicity Lactic acid which has produced particularly tragic accidents when by mistake it has been mixed with infants formulas has equal toxic and corrosive actions Paradoxically strong solutions of corrosive agents may produce less

damage than weak because they often cause enough pharyngospasm to result in their rejection by the throat before they can be swallowed Weak solutions on the other hand may not be recognized as noxious within the mouth especially by children and so may be swallowed readily Lye is such a potent corrosive that even a small amount of a relatively weak solution usually exceeds the corrosion threshold of the mouth throat and esophagus

The site of maximum esophageal injury is determined by the points along its course at which reflex segmental esophagospasm causes temporary delay in passage of the corrosive material The physiologic narrowings of the esophagus have nothing to do with this In approximately 20 per cent of cases the maximum damage is done in the proximal one third of the organ in another 20 per cent the middle one third is most damaged and in 30 per cent the distal one third In the rest of the patients injury is widespread

The course of the clinical manifestations parallels the pathologic events closely and it is well to think of the two together There are certain peculiarities from corrosive to corrosive but the results of lye poisoning serve as a good prototype The immediate picture is characteristic whatever the poison The patient feels an intense burning pain in mouth and chest There is often severe vomiting followed by many minutes of retching The mucosa of the tongue mouth throat and esophagus quickly becomes edematous The surface change is a coagulation type of necrosis and this quickly leads to appearance of sloughed erosions and ulcers Large irregular areas of the lips and tongue become denuded Spasm and edema within the esophagus may produce temporary occlusion within a few hours As the surfaces slough heavy purulent exudate forms The affected areas may quickly become secondarily infected and masses of bacteria are often found in the exudate which pours from the necrotic mucosa The patient develops a febrile reaction which usually lasts about four days and leukocytosis which lasts about a week

By the end of the first day the esophagus has developed a bleeding sloughing surface which is covered by necrotic exudate The apparent depth of erosion is accentuated by edema Esophageal perforation and suppurative mediastinitis may end things here but this is rare Survival past the acute stage is the rule although the patient feels and appears critically ill There are high fever dehydration severe pain in the throat and chest hydrophobia periods of semicoma and oliguria By the third day the edema subsides By the fifth destruction and sloughing come to an end and the pathologic picture is dominated by new soft granulations

Repair begins at the end of the first week and the patient then feels very much better Now starts the dangerous asymptomatic period when patient family and doctor may be betrayed by the treachery of silent fibroplasia and heavy collagen replacement Structurally the esophageal wall is weakest during the second week but shortly a large amount of fibrous tissue is deposited Secondary infection is an important factor in the formation of cicatrization and stricture Once it has been injured by corrosion the esophagus may develop one or multiple strictures at any time during the patient s life However in about 99 per cent of cases dysphagia draws attention to the appearance of strictures within eight months of injury and in about 60 per cent this happens within one month

The main spontaneous complications of corrosive esophagitis early in the course are aspiration pneumonia and massive esophageal necrosis with perforation and mediastinitis Later on bronchoesophageal fistula occasionally pyloric stenosis secondary superimposition of tuberculous infection and carcinomatous degeneration of scarred areas may supervene Just as important are the potential complications which of necessity accompany treatment One may say with conviction that the saddest complication of all is the completely stenosed esophagus which invariably is the result of therapeutic neglect The patient who must spend the rest of his life with a gastrostomy or who must undergo endless operations for construction of an artificial esophageal substitute is miserable evidence

of mismanagement somewhere along the line Maternal education is part of the solution

TREATMENT

Sometimes the patient is brought to the doctor immediately after the accident and sometimes not until late in the reparative stage In the latter case treatment must be taken up at whatever point the course presents Needless to say prophylaxis is the most important consideration of all When prophylaxis in the home has not prevented the accident much of early treatment has as its main purpose prophylaxis against stricture formation It is often very difficult to decide from inspection of the patient his mouth and pharynx whether esophageal damage has been done There may be no way to judge how much caustic has been consumed or if any has been swallowed at all If there is suspicion of poisoning the patient should be hospitalized for observation The course of the temperature and of the leukocyte count are helpful in judging injury as time goes on Meanwhile during the first hour it probably helps to make gestures at neutralization of the poison In the case of children the mother often will have done this Two per cent acetic acid or vinegar may be quickly available and they seem to be satisfactory neutralizing agents when the poison is lye A large amount should be used and vomiting encouraged

If it is found that there has been corrosion its treatment must be begun immediately and vigorously No favor is done to the patient when a conservative attitude is adopted The doctor must not fear the patient s injured esophagus Antibacterial therapy is begun immediately and continued for at least two weeks In addition to help in prophylaxis against acute complications contributed by secondary bacterial infection this is important in reducing the severity of eventual stricture tendencies Penicillin Aureomycin and streptomycin are frequently used Problems in dehydration undernutrition and anemia must be dealt with during the early part of the course

Local treatment of the esophagus is begun immediately A modification of the Salzer technic is recommended again with the warning that a conservative attitude can only be condemned A Levin tube is passed into the stomach following immediate efforts at neutralization and left in place for two days This maintains a lumen and permits hydration during the period of edema and severest odynophagia Esophagoscopic examination is carried out on the second day and a detailed evaluation is made of the extent of injury Dilatation begins with this examination Hurst mercury bougies are used It is important to understand that one must use large caliber dilators Not only are narrow dilators considerably more dangerous but also nothing is gained by their use The principle is to maintain normal esophageal diameter through the period of reparation as a prophylactic measure during the early stage nothing is actually being dilated For children one may choose to begin with a # 26 Fr and for adults a # 36 Fr In the former circumstance one progresses to a size compatible with the age of the child One should progress at least to a # 45 Fr in the adult

Dilatations are carried out daily for two weeks In the hands of a gastroenterologist who has become familiar with peroral instrumentation the manipulations do not add much to the dangers which already exist The first few days the bougie commonly shows blood on its surface upon withdrawal During the second week the amount of resistance encountered commonly increases Esophagoscopic evaluation is repeated at the end of the second week and at this time the organ is studied roentgenologically Meanwhile oral feedings of as normal a diet as the patient *will tolerate are pressed*

After the second week it may seem reasonable to continue dilatations less frequently perhaps only every other day for the next two weeks Finding that dilatation is becoming increasingly more difficult however should be considered a warning that efforts cannot be relaxed This is likely to happen during the fourth fifth and sixth weeks Occasionally one finds that esophageal narrowing is getting ahead of dilatations and then it is necessary to change to more vigorous

dilatation with metal olives In general the course of dilatations can be governed only by the progress being made but in most cases one must plan on dilatation for at least several months at longer and longer intervals Thereafter the patient must undergo esophagoscopic and roentgenologic evaluation every four months with dilatation when it is found desirable for at least six years Often enough dilatations must be continued at intervals for the rest of the patient s life This happens almost exclusively in patients who have not had early dilatation If treatment is begun by the second or third day after poisoning a rather static esophageal lumen can be *expected in most* cases by the end of six months It must be remembered that the patient s own evaluation of his swallowing mechanism may be most misleading in judging the progression of fibrosis

Cortisone inhibits the fibroplasia of inflammation and its use in the treatment of corrosive esophagitis theoretically should help prevent stricture formation It has been used in several cases and it is thought to add something to the effectiveness of therapy It is not however a substitute for any part of the regimen outlined above If the decision is to use cortisone, the drug must be started within a day or so of the poisoning with perhaps 300 mg the first day 200 mg the second and 100 mg daily for about four weeks Potassium supplementation must be used Cortisone can not yet be recommended wholeheartedly because of the several special dangers which accompany its use in the patient with corrosive poisoning Those of omnipresent local bacterial infection the threat of esophageal perforation and the danger of delayed or faulty healing are particularly important

RUPTURES AND PERFORATIONS

Most primary esophageal diseases may at times become complicated by perforation and the same may be said of certain extrinsic and far removed diseases It is spreading mediastinitis which makes esophageal perforation the catastrophe it is The mediastinum is composed of wisps of connective tissue which are so loose and so hypovascular that suppuration runs through without restriction except for that exerted by the fascial planes Free perforation is of course the most serious form If existence of an esophageal lesion for some time prior to its perforation has created enough local reaction to restrict spread of resulting infection the result is somewhat less dangerous If there is direct extension of the perforation through the pleura the mediastinum escapes gross contamination and can drain naturally into the pleural space Improved surgical technics and the newer antimicrobial agents have improved the prognosis *considerably but the different varieties of* esophageal perforation continue to be as serious as any gastrointestinal emergency

SPONTANEOUS RUPTURE

Under certain conditions the normal esophagus is made to rupture spontaneously with the production of a catastrophic clinical problem In some instances it may be impossible to prove in retrospect that the esophagus was previously entirely normal but the clinical picture and implications are not affected much whether it was or was not This is a disease which affects all ages from childhood to very old age About 80 per cent of affected people are males A portion are alcoholics About one third have either duodenal or gastric ulcer

Mechanical factors are more important than physiologic ones in determining the nature of the lesion This is a bursting injury producing a linear tear which in 95 per cent of cases parallels the axis of the organ In rare exceptions the tear is transverse and complete spontaneous transection of the esophagus has been reported The wall of the ampulla is involved in 90 per cent of the cases usually beginning about 2 cm above the diaphragmatic hiatus and half of the ruptures extend through its left lateral aspect Ruptures as high as the middle one third of the organ are very rare In half the cases the mucosal split is more than 3 cm long and in 10 per cent more than 6 cm The mucosa

is the toughest of the organ s layers but because it ruptures first the length of its tear may be greater than that which opens through the other layers Commonly the mural layers are dissected apart and the tear in one may not correspond to that in the next

Spontaneous rupture may occur under various conditions *Frequently it follows an unusually* large meal or happens during the retching and vomiting of acute alcoholism Occasionally the patient is asleep or merely engaged in routine quiet activities The stomach may be empty or full at the time Sometimes the patient who has a duodenal ulcer gives a history of chronic gastric retention The postoperative period particularly that which follows craniotomy seems to favor spontaneous rupture Other situations which are common at the moment of rupture are retching in an effort to dislodge a foreign body grand mal seizures defecation engagement in sports and pushing or lifting Spontaneous rupture has been observed during corticotropin therapy but the etiologic significance is not clear

For rupture there must obviously be a tremendous intraesophageal bursting force exerted from the gastric approach If the stomach is full its contents are driven into the periesophageal tissues In about 75 per cent of cases the rupture breaks into the left pleural cavity In others the mediastinum becomes filled with gastric contents and air Rarely does the esophagus rupture spontaneously into the peritoneal cavity

At the moment of rupture the patient ordinarily experiences a sudden excruciating pain deep in the chest the epigastrium or back If he is receiving steroid hormone therapy at the time however the moment of rupture may pass unnoticed Rarely in previously healthy people the catastrophe is not suspected until gastric contents are recognized in material aspirated from a suddenly appearing pleural effusion Ordinarily the patient *either immediately* collapses *or develops* shock within an hour or two Without treatment death commonly follows in 48 hours The abdomen often becomes rigid and respiratory pain leads to rapid short respirations If the patient is known to have a duodenal or gastric ulcer the picture may be interpreted as that of ulcer rupture The pain is remarkably refractory to opiates The temperature is normal at the outset and usually leukocytosis does not develop for a few hours *A pleural rub often appears early* The most helpful physical finding cervical subcutaneous emphysema unfortunately does not develop for several hours and then is found in only half the patients A mediastinal crunch can usually be heard if the rupture has been contained within the mediastinum (Hamman s sign)

Considerable diagnostic help is to be had from x ray study of the chest Discovery of pneumohydrothorax under these clinical conditions is indicative of esophageal rupture Air may be found in the mediastinum before a mediastinal crunch can be heard Appearance of large amounts of air widely disseminated through the mediastinal fascial planes and cervical muscle planes is common after a few hours have passed

EXTERNAL TRAUMA

Crushing injuries and blunt blows rarely injure the esophagus When they do the trauma to near by organs ordinarily kills the patient The same is usually true of gun shot and knife wounds which reach the esophagus Men who work with compressed air hoses have been known to put the end in their mouth and press the release The result is a particularly destructive bursting of the esophagus and often stomach

INSTRUMENTAL INJURY

The dilemma of esophagology is that the esophagus is the most fragile of organs yet diagnosis and sometimes treatment of most of its diseases require intraesophageal instrumentation Technics for esophageal endoscopy biopsy foreign body manipulation and *bouginage have been developed to the point* where they are satisfactorily safe considering the job to be done Accidents continue Nevertheless the gastroenterologist who shuns

a dangerous situation when the indications for action are clear is guilty of greater moral neglect than one who using proper precautions, inadvertently injures the patient One often reads that a certain intraesophageal procedure should be carried out with special care or very gently If the gastroenterologist is not planning to use special care and gentleness every time he approaches the esophagus he has no business doing esophageal manipulations The doctor s own personality characteristics unfortunately seem to have a lot to do with his accident rate and some men can never become safe esophagologists no matter how much training and experience they may acquire It is important to recognize this in one s self and even more important that the teacher assume the unpleasant responsibility of acquainting his student with the fact just as soon as natural ineptness is recognized

The areas which are particularly vulnerable to instrumental injury are the hypopharynx just above the cricopharyngeus muscle the cervical esophagus and the distal portion just above the ampulla Behavior of subsequent infection depends on certain rather predictable anatomic and pathologic peculiarities of the regions Because direction of spread is governed to a large extent by the surrounding fascias intimate knowledge of cervical and mediastinal fascial anatomy is particularly important for the surgeon who must drain the infection Often enough the endoscopist is unaware at the time that any injury has been done The direction in which infection travels then becomes the only means for estimating the site of perforation

Most esophagoscopic and about one third of gastroscopic perforations occur through the posterior pharyngeal wall just above the cricopharyngeus muscle The explanation is rather simple the cricopharyngeus which is able to accommodate very large objects when relaxed is ordinarily in a state of tonic contraction Normally relaxation occurs only with swallowing Unless an instrument which is passed without active help from the patient is insinuated directly into the potential lumen it cannot pass without doing injury to the mucosa The pharyngeal contours tend to guide it into one of the pyriform sinuses when the cricopharyngeus is contracted opening the way for infection to spread down through the pretracheal space It is for this reason that blind esophagoscopy with the help of an obturator is safer than direct vision passive esophagoscopy the patient actively swallows the instrument himself in the first instance thereby opening his own cricopharyngeus muscle automatically whereas direct vision esophagoscopy makes it necessary for the endoscopist to push open the cricopharyngeus

The second common explanation for hypopharyngeal perforations is normal roughness or osteophytic prominences of the anterior surface of the cervical vertebral bodies (Fig 18) Tissue between an instrument and these roughnesses is very thin Pressure against it puts a severe strain on tissue continuity Perforations here lead to infection which spreads down through the retrovisceral space

Hypopharyngeal perforations ordinarily manifest themselves by deep cervical pain the sensation of a foreign body in the throat fever and swelling of the neck Subcutaneous emphysema may appear within a few hours and it often spreads very rapidly Deep cervical edema and emphysema may obstruct respiration and tracheotomy sometimes must be done Spread of infection down into the chest is rapid if the retrovisceral space has been entered

Rather often the signs of hypopharyngeal injury are erratic and most misleading for purposes of evaluating the extent of the damage done Indications of injury may be delayed for many hours perhaps days They may be present at first merely as mild fever and a little local discomfort only to erupt suddenly into the signs of fulminating infection This is obviously a dangerous situation and it must always be assumed paradoxically that delayed evidences of injury point to serious injury The explanation is obscure but it seems reasonable to believe that pressure

necrosis develops perhaps at a point caught between the instrument and a bony vertebral process and that tissue dissolution becomes progressive

The mechanism which makes the cervical esophagus below the cricopharyngeus so vulnerable to perforation is not understood Presumably roughness of the spine plays a part here too Women in late adult life seem to be particularly susceptible This is almost always a retrovisceral perforation and quick extension of resulting infection part way down into the mediastinum is the rule Perforations of the cervical esophagus manifest themselves by dysphagia dyspnea cyanosis fever emphysema cervical swelling and forward displacement of the trachea

Distal esophageal perforation is usually secondary to dilatation or the taking of biopsy specimens Perforation of this sort is likely to remain within the mediastinum for a few hours Although the stomach is ordinarily empty at the time of instrumentation normal secretory activity leads to the probability that vomiting will drive significant amounts of material into the tissues This produces a clinical picture like that of spontaneous rupture More often the injury is much less catastrophic with merely a day or so of fever and then it is usually said that the



Fig 18 Natural roughness of the anterior surface of the cervical vertebral bodies and osteophytic changes as shown in this patient constitute a hazard during esophageal manipulations By irritation they may become responsible for web formation

mucosa has only been split permitting bacteremia

TREATMENT

Occasionally it is proper to treat mild instrumental injury of the hypopharynx conservatively, *if one can assure himself that the* process has not extended beyond the immediate vicinity of the injury This is as has just been emphasized a difficult and dangerous decision to make Conservative management consists of heavy coverage with antimicrobial drugs perhaps penicillin and streptomycin

As soon as actual rupture or perforation of the hypopharynx or esophagus is recognized plans for immediate emergency surgery must be made antimicrobial therapy begun and a Levin tube passed into the stomach for constant aspiration One must not fear the passing *of a soft tube under these circumstances* It can do no harm and if the tip should follow the perforation out into the mediastinum aspiration here for a few minutes will be helpful before another effort is made to pass it into the stomach

The principle of treating esophageal perforation is quick surgical drainage of the mediastinum either by the classic von Hacker superior mediastinotomy or by a transthoracic approach The former can be counted upon to drain areas no lower than the level of the fourth thoracic vertebra and therefore is useful only for certain instrumental injuries Spontaneous rupture always calls for thoracotomy In either case the mediastinum is opened widely and drained superiorly if it is approached from above and into the pleural cavity if a transthoracic operation is used Packing of the mediastinum is not done Most surgeons make an *effort to find and close* the perforation Some do not because the perforation is usually very difficult to find the different esophageal layers may be torn at different levels the esophageal wall itself may benefit from external as well as internal drainage sutures placed in juxtaposition with a traumatic rupture do not stay put very long and if the mediastinum in the area has been opened well there is likely to be little possibility of the persistence of a fistula

With quick surgical mediastinotomy adequate use of antimicrobial drugs and care for fluid and electrolyte needs the prognosis is relatively good It is important to understand that the mediastinum must always be *opened no matter* how late the patient is first examined or how poor his general condition seems to be Often the surgeon finds that the mere act of mediastinal decompression causes immediate dramatic improvement in the patient s condition

BENIGN TUMORS

BENIGN EPITHELIAL TUMORS

These are rare and unimportant esophageal tumors Papillomas or epitheliomas are sessile or pedunculated masses of hyperplastic *squamous epithelium which apparently* develop in response to local epithelial irritation Sometimes they form in achalasia They may be discovered at any age including early childhood Because multiple lesions sometimes occur it is important to differentiate this process from leukoplakia by multiple biopsies There is possibly a malignant potential

A mucosal polyp is composed of loose connective tissue surrounded by a sac of normal epithelium It may become very large conforming to the configuration of the esophageal lumen Even when attached high in the esophagus it may hang to the cardia Rarely the lower end becomes everted out through the mouth during vomiting where it presents as a long insensitive tongue like mass

Adenomas occasionally develop in the native esophageal glands and in heterotopic *islands of gastric mucosa* It is not known whether there are malignant implications

BENIGN NONEPITHELIAL TUMORS AND CYSTS

All of the connective tissue vascular and neurologic elements of the esophageal wall are capable of undergoing benign neoplasia *The resulting benign tumors are rather rare* and at that only about 15 per cent are responsible for symptoms They account for

about 1 7 per cent of all esophageal tumors and for the symptoms of about 0 1 per cent of people who complain of dysphagia They are found in about 0 2 per cent of autopsy and surgical esophagus specimens Most are encountered by surprise

Many histologic varieties are represented and a portion of the tumors contain compounded tissue types Approximately 70 per cent are leiomyomas 9 per cent are cysts of various types 8 per cent are fibromas and smaller numbers are lipomas angiomas neuromas etc Most arise from tissues deep to the muscularis mucosae They expand very slowly and as a rule symmetrically Occasionally pedunculation may carry a tumor into the esophageal lumen Although they sometimes grow to a very large size most are only a centimeter or so in diameter when first discovered by chance or design Both roentgenologic and esophagoscopic study characteristically show only nondescript intramural bulgings The tumors are almost always too deeply situated to be reached by biopsy forceps

When symptoms are produced the patient usually complains only of dysphagia In rare instances there may be enough interference with deglutition to lead to starvation If the tumor is large it may produce deep chest pain The free end of pedunculated tumors of large size can be ejected from the esophagus into the throat or out of the mouth by vomiting Erosion of the overlying mucosa with slow blood loss sometimes occurs but deep ulceration and severe hemorrhage are rare All benign nonepithelial tumors are managed by surgical extirpation except the angiomas

Leiomyomas develop from the muscularis propria (Fig 19) In about 25 per cent of patients more than one is present They are able to reach a diameter of 15 cm but there is a tendency for them to grow very slowly remaining flat and narrow as they enlarge Some nearly encircle the esophagus especially those that develop at the cardia A characteristic roentgenologic configuration is that of a lobulated shrimp like spiral which winds part way around the organ

Fibromas are usually of compounded histologic composition A dumbbell tumor transfixing the esophageal wall is sometimes encountered Lipomas characteristically are pedunculated and are usually attached high in the esophagus

It is important to recognize the nature of hemangiomas because these tumors respond better to x irradiation therapy than to surgical extirpation Occasionally the roentgenologist detects phleboliths in an extramucosal esophageal tumor and is then able to suggest the diagnosis If the lesion is superficially located it may be possible for the esophagoscopist to become suspicious of its nature by its blue color Biopsy of a hemangioma may produce serious hemorrhage

Esophageal cysts comprise a heterogeneous group which are included under the present heading because of similarities in their gross behavior Identification and classification depend on the nature of the epithelial lining Unfortunately the epithelium sometimes has become necrotic and has disappeared by the time the cyst becomes available for study Reduplication cysts are spherical or obloid miniatures of some part of the gastrointestinal tract usually stomach which develop and grow in close proximity to the esophageal wall Rarely the esophagus is completely duplicated by a blind twin member which begins in the neck passes through its own hiatus in the diaphragm and ends in the upper abdomen Tracheobronchial cysts develop within or are attached to the esophageal wall There are other rare types These are congenital lesions and they often make their presence known during childhood The clinical problems are ordinarily those of displacement and compression of the thoracic organs

PRIMARY CARCINOMA

One might think that carcinoma of the esophagus would be one of the more favorable gastrointestinal cancers to recognize and treat It grows in a narrow and vulnerable tube its presence is recognizable on physical examination by auscultation of the swallowing sounds the esophagus is especially accessible

to both roentgenologic and endoscopic examination and technics are now available for resection of all parts of the esophagus with reconstitution of its continuity But the fact is that overt symptoms do not drive the patient to the doctor early *and in spite of the* brilliant advances of recent years in the technology of esophageal surgery carcinoma of the esophagus remains one of the most discouraging of tumors In addition to the fact that it can almost never be cured in many instances *its miserable complications* cannot be prevented either surgically or by radiation therapy Elimination of pre examination delay is part of the answer, but one supposes that if this can be *accomplished pretreatment* delay at the doctor s hands will necessarily be increased The younger and more curable a tumor is the more difficult the diagnosis will ordinarily be and esophagectomy is too mutilating a procedure to be contemplated unless the diagnosis of cancer is rather certain But radical attempts to cure carcinoma of the esophagus are as yet in an early stage of development It is too soon to consider giving up surgical efforts directed at

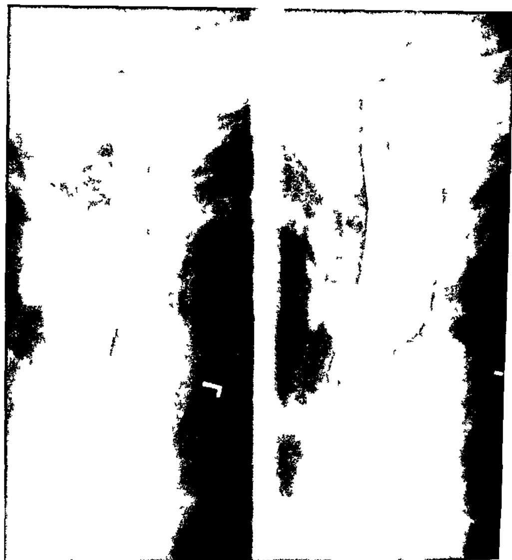


FIG 19 Leiomyoma of proximal esophagus The tumor had infringed to this extent on the esophagus before dysphagia became important to the patient

cure although this may prove desirable as time goes on The answer probably lies in chemotherapy but as yet no progress has been made in this direction It can be predicted that operative therapy will always be indispensable for palliation and management of complications

PREVALENCE AND PREDISPOSITION

Carcinoma of the esophagus is a common gastrointestinal cancer in all parts of the world but there are variations in both geographic and racial susceptibility In this country and Europe the autopsy incidence is about 1 3 per cent Among patients who die of cancer esophageal carcinoma is found to be responsible in about 7 1 per cent It is the primary disease of 0 1 per cent of patients entering general hospitals in some sections of the country In approximately 85 per cent of cases the patients are men About 11 per cent of carcinomas which kill men arise in the esophagus while only 1 5 per cent of those which kill women are esophageal Negroes appear to be about twice as susceptible as Caucasians in this country although in some other areas of the world negroid peoples do not appear to be particularly threatened by the tumor In some clinics in the United States with large Negro-patient populations carcinoma of the esophagus is the most common malignant neoplasm of the gastrointestinal tract Interracial variability in susceptibility seems to exist among Oriental peoples too for carcinoma of the esophagus is relatively prevalent in Japan but considerably less so in most parts of continental Asia

About four fifths of the patients are between the ages of 40 and 70 years at the time of death In most reported series the age of 30 years marks the lower end of the age range A few teen aged patients have been reported

It is generally stated that chronic irritation in some cases plays a part in initiation of esophageal carcinoma Usually no irritating factor is evident but it has been common experience to find a relatively high incidence of esophageal cancer among people who have old corrosion injuries chronic strictures and achalasia Customary use of hot liquids has been cited as important in some societies Adenomas are believed to have malignant potentialities in the esophagus as elsewhere Possibly primary ulcers syphilitic lesions and tuberculosis do too

LOCAL GROWTH CHARACTERISTICS

For clinical thinking and for therapeutic planning no feature of the disease is more important than the level along the esophagus length at which the tumor originates In women carcinomas tend to involve the most proximal part of the esophagus as well as the hypopharynx (postericoid carcinomas) but carcinoma of the cervical esophagus is distinctly unusual in men Carcinomas generally demonstrate an increasing degree of histologic malignancy as one progresses from proximal to distal end of the organ and autopsy study shows a greater incidence of distant metastases from distally located tumors The effects of contiguous centrifugal spread differ considerably of course with the location of the cancer Finally the possibility of surgical resection and the technical problems involved in re-establishing continuity are governed to a very large degree by the level of growth

In most cases it is possible to determine the general location of tumor inception through roentgenologic and surgical examination By combining figures from many series it is found that 21 per cent of esophageal carcinomas originate in the proximal one third of the esophagus 36 per cent in the middle one third and 43 per cent in the distal one third Rarely a lesion spreads rapidly along the wall to involve the whole organ

Locally there may be several simultaneous growth configurations but usually a tumor may be classified either as polypoid fungating ulcerative or infiltrating *Polypoid* carcinomas are unusual in the esophagus Histologically they are often adenocarcinomas They may grow to a large size before making their presence known because for some reason they do not often cause significant obstruc

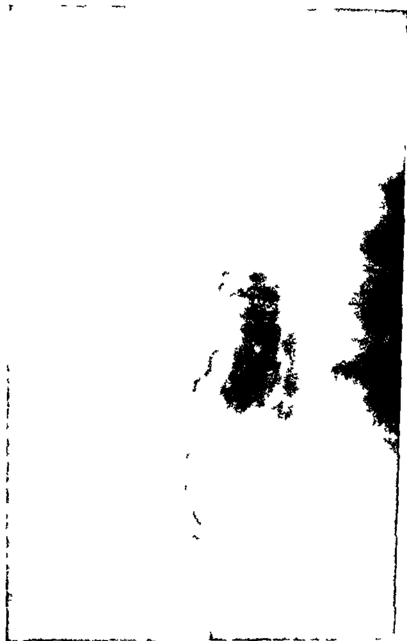


FIG 20 Fungating type of esophageal carcinoma It has en circled the organ and infringes to some extent on the lumen

tion The *fungating* form is most common (Fig 20) This is a type which tends to en circle the esophagus early and so to produce obstruction The surface is friable and soon becomes necrotic and secondarily infected Necrosis may extend to cause fistula forma tion Rarely is there significant bleeding from the surface The *ulcerative* form is rather rare Only squamous cell carcinomas assume this form The clinical characteristics are anemia early metastasis and late obstruction *Infiltrating* carcinoma is common The over lying mucosa ordinarily remains intact for a period but esophagitis often develops over it The tumor tends to encircle and stenose early

The most characteristic feature of carci noma growth in the esophagus is its tendency to occlude the lumen As just pointed out the rapidity with which this is accomplished depends on the gross growth form of the

tumor Unless death supervenes or treatment prevents it however all will eventually cause obstruction An important feature of this obstruction as it is studied roentgenologically is that the uninvolved esophagus above the tumor dilates to only a minor extent—never to any such degree as is encountered in achalasia

Most patients with carcinoma of the esophagus die from the effects of local growth In addition to obstruction of the esophagus the tumors destroy vital contiguous organs and may produce fistulous communications with the environs The level at which the tumor grows determines which organs and tissues are damaged The common ones are the pleura trachea pericardium larynx aorta hypopharynx thyroid gland the recurrent laryngeal nerves bronchi lungs thoracic duct thoracic vertebrae stomach and diaphragm By the time of death the esophageal tumor has penetrated or perforated into one or more of these structures in at least two thirds of the cases Free perforation into the mediastinum occurs in only 4 per cent but a tracheobronchial fistula forms in 18 per cent Fistulous connections with the lung parenchyma pericardial sac and one of the major regional arteries especially the left common carotid are other possibilities The aorta is damaged not by direct invasion but by occlusion of its vasa vasorum When the aorta is opened as a result of tumor extension the amount of blood lost is not always immediately great

HISTOPATHOLOGIC FORMS

Approximately 68 per cent of esophageal carcinomas are squamous cell carcinomas 30 per cent adenocarcinomas and the others are too undifferentiated for further identification Adenoacanthomas are very rare The great majority of adenocarcinomas develop in the distal esophagus and there is considerable question whether all or even most of thes are of esophageal origin It seems likely that many are actually gastric carcinomas developing in the gastric portion of the vestibule This matter will be discussed in the next chapter Squamous-cell carcinomas rarely occur in the Grade I category of the Broders classification The prognosis of adenocarcinomas is generally better than that of squamous cell carcinomas but this is a feature which varies considerably from series to series and it is mighty relative at best

METASTATIC TENDENCIES

The mediastinal lymphatic system is the main route of metastasis There is a distinct tendency for metastases to remain within the mediastinum in the early part of the course and by the time of autopsy distant metastases can be found in only about 65 per cent of cases Tumor plugging of the esophageal and mediastinal lymph vessels progresses in an erratic fashion After the mediastinal nodes superior to a carcinoma have become invaded lymph obstruction develops and then there may be reversal of lymph flow so that inferior node groups become invaded The paraesophageal and pretracheal nodes are first and most often involved Long travel of metastases through the mediastinum may cause simultaneous invasion of the deep cervical and paracardial node groups

Hematogenous metastasis is a less active process Carcinomas of the distal portion of the esophagus are somewhat more prone to move by this route than are tumors originating higher in the chest The paravertebral veins of Batson may be used in some cases Incidences of metastatic organ involvement as discovered at autopsy are shown in Table 1

Metastasis to the esophagus itself with formation of satellite tumors is not excessively uncommon an important consideration for the surgeon who has elected to resect an esophageal carcinoma Rarely primary carcinoma of the breast pancreas testicle stomach and a few other organs metastasize to the esophagus

CLINICAL MANIFESTATIONS

The important symptom is dysphagia This is the initial complaint in about two thirds of patients and it is indirectly responsible for most of the other symptoms It is mild and

TABLE 1 SITES OF METASTASES OF ESOPHAGEAL CARCINOMA AUTOPSY OBSERVATIONS

Site of Metastasis	Walther (12) (% of 34? cases)	Walter Reed Series (% of 100 cases)
Regional nodes	53	71
Lungs	23	36
Liver	21	36
Bone	9	9
Kidney	6	18
Adrenals	4	8
Spleen	2	0
Thyroid	1	9
Myocardium	1	10
Brain	0 9	0
Pancreas	0 6	8
Meninges	0 3	0
Skin	0 3	0
Thoracic duct	0 3	0
Stomach	0 3	0
Prostate	0 3	0
Esophagus	—	6

often inconstant at onset An opportunity for early diagnosis is sometimes lost by assuming that it represents globus hystericus When dysphagia appears suddenly it must be assumed that a food bolus has briefly caught in a previously silent narrowing Women often interpret the sensation caused by cervical esophageal carcinoma to be due to a sharp foreign body Eventually almost all patients develop dysphagia

Symptoms secondary to obstructed deglutition are frequent and dangerous Overflow manifestations commonly occur at night with regurgitation of saliva choking and sialorrhea Pulmonary complications especially pneumonia and acute abscess are common but in many cases they seem due to tumor penetration into the lung and tracheobronchial tree rather than to transadital aspiration The systemic consequences of dysphagia are quick weight loss weakness and eventually profound inanition It is important to understand that by the time dysphagia develops even though it be the first symptom the tumor may be old and extensive in its local spread Weight loss then is likely to be a sign of the late stage of the disease

Inanition is usually accompanied by pain and this may be felt over a wide area Ordinarily it is most intense substernally in the epigastrium or in the middle of the back Invasion of the recurrent laryngeal nerves is moderately common when carcinoma originates high along the esophagus and hoarseness is the result Sometimes this symptom is strangely intermittent Phrenic nerve and diaphragmatic invasion occasionally occurs causing persistent singultus

Physical examination is notable largely because of absent or prolonged swallowing sounds There is no other sign which points to the primary disease and if the patient is examined early in the course of illness no other sign of any disease Later all of the manifestations of undernutrition appear Evidence of metastatic tumor is found by combined physical examination and roentgenologic study in only about 10 per cent of the patients when they are first examined

DIAGNOSIS AND DIAGNOSTIC DELAY

Diagnosis depends on roentgenologic examination esophagoscopic inspection and transesophagoscopic biopsy (Fig 21) In patients with spinal deformities which preclude endoscopy cytologic examination of esophageal aspirates may sometimes furnish specific diagnostic information Roentgenologic examination fails to show any sign of esophageal abnormality in about 6 per cent of patients who can be proved by esophagoscopic examination to have cancer The esophagoscopist is unable either to insert the esophagoscope or to reach the area of tumor in about 6 per cent of patients who by x ray study are believed to have cancer X ray examination remains negative to the time of death in only about 2 per cent of patients

Although transesophagoscopic biopsy is by far the most effective diagnostic technic there are failures The first biopsy specimen fails to include tumor in about 10 per cent of cases There are three usual explanations submucosal position of the cancer prevents contact of biopsy forceps with tumor tissue obstruction by the intramural orad end of

the tumor precludes access to an exposed area and simple misdirection of the forceps sometimes happens (Fig 22) The implication is clear if the biopsy specimen from a suspicious lesion fails to include tumor esophagoscopy and biopsy must be repeated sometimes more than once esophagitis Heavy sheets of epithelium then interfere with both visualization and palpation Silver clips attached to the apparent orad limit of the tumor by the esophagoscopist enhance the value of roentgenograms to the surgeon The endoscopist must also make a careful evaluation of the diameter and direction of the lumen through a stenosing cancer Often it is not possible to insinuate the instrument through the area so reliance must be placed on probings For the same reason often no information may be obtained regarding the length of the lesion a feature best studied roentgenologically



FIG 21 Esophagoscopic view of squamous cell carcinoma of midesophagus as seen under four diameter magnification

In addition to taking biopsy specimens the esophagoscopist can play an important part in assisting localization of the most proximal edge of the tumor for surgical planning This is sometimes made difficult because of involvement of the proximal portions by exfoliative

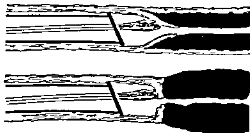


FIG 22 Two of the factors interfering with accessibility of esophageal carcinoma to the biopsy forceps normal mucosa overlying deep intramural growth and luminal narrowness preventing access to exposed tumor

The roentgenologist cannot often furnish a specific diagnosis with positive assurance His main responsibility is to detect the presence of tumor In addition to calling attention to the need for esophagoscopic examination and biopsy he can usually give reliable information regarding the length and configuration of the lesion the course and diameter of the lumen through the tumor and the presence of sinus tracks and fistulas Roentgenologic examination is unfortunately not able to show how thick a tumor is or to what extent the mediastinal structures are involved by di

rect extension Pulmonary metastases and pulmonary and bronchial complications are ordinarily diagnosed with assurance only by roentgenologic study Bronchoscopic examination is important prior to contemplation of surgical treatment because this is the only means by which tracheal invasion can be detected

The prepatent period of carcinoma of the esophagus is not known It is certain that most tumors grow for a good while before they make their presence known because it is distinctly uncommon to encounter a small one In some autopsy series as many as 10 per cent of esophageal carcinomas are discovered unexpectedly partly because absence of symptoms had failed to stimulate investigation of the esophagus during life and partly because the esophageal lesion had remained unrecognized during the course of other fatal disease In recent years the interval between onset of symptoms and establishment of a diagnosis has averaged about five or six months Survival following diagnosis regardless of the form of therapy averages too about five or six months

TREATMENT

In addition to supportive measures which revolve largely about attempts to restore nutritional health there are three main methods of attack on the cancer These are surgical extirpation x irradiation therapy and manipulations to maintain the esophageal lumen Frequently all three are used Dilatation is always the first consideration and continuously a pressing one its purpose being to keep a channel open so that feeding by the oral route may be maintained throughout the patient s course whatever other treatment is used

Even though the tumor be resected the need for dilatation continues to be urgent for the anastomotic line of an esophagogastrostomy regularly tends to become stenotic with the passage of time If when the patient is first examined it is possible to get a tube however narrow through the tumorous area a channel can be maintained and there can be no excuse for permitting it to close Esophagoscopic help is often required for the first intubation If the lumen is tortuous at the start an intragastric tube left in place several days will straighten it out Then Hurst mercury bougies are used for dilatation There is more danger and less day to day certainty about dilatations of a cancer than dilatations of other stenosing lesions In most cases if one can maintain a # 30 Fr diameter indefinitely he is obtaining satisfactory results If it becomes clear that tumor growth is getting ahead of dilatations it is best to leave an indwelling gastric tube in place In this situation metal olives have nothing to offer over Hurst bougies The Guisez tube is a short segment of stiff tubing designed to be placed transesophagoscopically within the lumen of just the cancer itself for permanent residence An upper flange prevents its passage into the stomach Occasionally a Guisez tube or variation thereof proves very satisfactory for maintaining a lumen but the tube itself sometimes becomes plugged with food and must be removed However the problem is handled a gastrostomy or jejunostomy should be avoided at all costs

The results of surgical extirpation are fairly good for palliative treatment of obstruction and extremely poor for cure The anticipated degree of palliation must be balanced against the current high risk of esophagogastrectomy and the expected short postoperative survival Operative mortality for resection of esophageal carcinoma ranges from 15 to 35 per cent and for exploration when resection cannot be carried out from 10 to 20 per cent Without resection an occasional patient survives two years beyond the time of diagnosis With resection and radiation therapy a rare patient survives four years beyond treatment In general the over all expected survival time in this era is not increased much by treatment

As stated above however it is too early to discontinue surgical efforts as yet Possibly until better technics become available superior thoracic and cervical carcinomas should be treated only by radiation therapy but there is a place today for resection of those of the distal part of the organ Even the enthusiastic

surgeon finds that only about 10 per cent of supra aortic carcinomas are resectable Various authors have reported that from 12 to 73 per cent of patients with a tumor at any level are suitable for mediastinal exploration and of these from 5 to 65 per cent have a tumor which is technically resectable as a palliative gesture In only about 10 per cent it is possible to perform an operation which is designed for cure The most important cause of operative death is immediate disruption of the esophagogastric suture line Postoperatively the main dangers are sudden alterations in cardiorespiratory function acid base disturbances pulmonary edema empyema following fistula formation and atelectasis

Radiation therapy may give symptomatic help for deep chest pain and it occasionally helps the obstructive factor It cannot be relied upon however and it is not innocuous treatment Ordinarily from 5000 to 6000 r tumor dose are given over the lesion Use of the rotating chair provides maximum deep therapy with minimum skin damage The main hazard of radiation therapy is encouragement of perforation and fistula formation It is a potent means of producing esophagopleural and esophagotracheal fistulas Not infrequently large arteries are opened and sudden exsanguination is a threat to every patient receiving radiation therapy

OTHER PRIMARY MALIGNANT TUMORS

CARCINOSARCOMA

These are rare tumors which histopathologically combine both carcinomatous and sarcomatous tissue There is some doubt about the validity of the pathologic concept Most carcinosarcomas which have been reported have been polypoid and at the time of diagnosis large

THE SARCOMAS

Primary sarcoma of the esophagus is distinctly uncommon The incidence at autopsy is about 0 03 per cent Three quarters of the patients are men and three quarters are between the ages of 40 and 70 years at the time of death The symptomatic picture is entirely similar to that of esophageal carcinoma the important complaint being dysphagia followed by deep chest pain weakness and weight loss Bleeding is considerably more common in the case of sarcoma

Most of the common sarcoma types occur Lymphosarcoma may develop as a unicentric lesion in the esophagus of young adults tending to grow as a nodular infiltrating tumor In spite of the common mediastinal location of Hodgkin s disease involvement of the esophagus is very rare Angiosarcomas may be recognizable as blood tumors upon esophagoscopic examination because of their blue red color The myosarcomas appear to be the most common esophageal sarcomas As expected from the organ s normal histology, almost all leiomyosarcomas occur in the distal esophagus Only two thirds of the rhabdosarcomas develop in the upper portions however The myosarcomas may assume several gross forms most basically being either pedunculated sessile or infiltrating Other reported sarcomas are fibrosarcoma neurogenic sarcoma melanosarcoma and mixed cell types

Diagnosis may be suggested at times by the roentgenologic and esophagoscopic pictures Biopsy is the most important diagnostic procedure Vascular tumors which would be dangerous to biopsy usually should give warning of the fact by their color

Treatment methods include surgical extirpation x irradiation therapy and use of the several applicable chemical agents Lymphosarcoma and the angiosarcomas respond well to radiation therapy but at the moment it seems best to recommend chemotherapy for lymphosarcoma Surgical experience has been limited and operative therapy has all the drawbacks mentioned in the discussion of carcinoma Several myosarcomas have been successfully extirpated

THE ESOPHAGUS IN SCLERODERMA

Probably the esophagus never escapes a certain degree of injury in the diffuse collagen diseases but only in scleroderma are our

spoken esophageal changes produced Dysphagia is the most common gastrointestinal complaint of the patient with dermatomyositis but this appears to be largely a pharyngeal dysphagia About 10 per cent of patients *with scleroderma have esophageal complaints* and two thirds of these are women There is no relation between the severity of the disease as a whole and the likelihood of esophageal involvement The chief symptom is dysphagia There may also be substernal pain pyrosis and epigastric distress

Roentgenologic *study shows well the ab*normal physiology at work Esophageal propulsion is slow or absent and there may be a delay in esophageal emptying for a half hour or more This is best brought out if the patient is examined in the horizontal position In addition to depression of the wave pattern there is loss of mural tone After passage of a barium bolus the lumen remains open and the walls retain a layer of the material The functional changes then are much like those of achalasia An im*portant difference is that the disease in* scleroderma is limited largely to the distal half of the organ

The pathologic abnormalities are apparent upon direct endoscopic inspection The patient with scleroderma is difficult to esophagoscope because of the tightness of the facial skin and because the cricopharyngeus muscle appears to become incoordinate in this disease Serial examinations show that the gross changes usually begin in the most distal part of the esophagus and very slowly progress proximally Seldom does more than half of the organ become grossly diseased The mucosa first shows fragility and atrophy Later appearances are much like those of subacute erosive esophagitis with erosions hyperemia *and* plaques of exudate The erosive process spreads freely so that large areas may become denuded Heavy white exudate accumulates Hyperplasia of the remaining epithelium produces leukoplakia and concurrent *healing of previous* destruction produces scarring The result is a coarse opaque thickened mucosa which is subdivided by deep fissures and *spotted with* ulcerations Approximately half of the patients with severe changes are found to have a direct hiatus hernia and it may be that shortening of the esophagus secondary to *scarring is responsible* True stricture formation is not common esophageal stasis is usually due to inefficient motility

Biopsy specimens from the mucosa show changes similar to those found in the skin In addition to the epithelial disease there is fibrinoid degeneration of the connective *tissue with swelling of the areolar ground* substance thickening and straightening of the collagen fibers increased fibrillary fragil*ity eosinophilia and general hyalinization*

Treatment by dilatation gives relief in some cases and should be practiced freely Drugs have no effect on the motility of the esophagus in this disease

PLUMMER VINSON SYNDROME

This is a deficiency disease of premenopausal women characterized by hypochromic *microcytic anemia and dysphagia Very few* typical cases have been reported in men or in Jews It is due to iron and vitamin B complex deficiencies and it affects for the most part people with physical features and racial *heritage* very *similar to those* characteristic of the pernicious anemia patient

Dysphagia which develops slowly over several months is the main complaint The sensation is interpreted as obstruction in the throat or low in the neck The patient may eventually be unable to swallow solids of any sort and liquids may cause a great deal of difficulty Seldom however does dysphagia progress this far before the patient seeks help Weakness fatigue and sore tongue are the only other symptoms

Physical examination usually shows a nervous edentulous woman between 30 and 50 years old There frequently are signs of multiple vitamin deficiencies Atrophic glossitis is almost always present Perleche and brittle finger nails are common In about one third of patients there is splenomegaly

the explanation for this incidence is obscure

Laboratory study always shows iron deficiency anemia and this may be very severe at the time the patient is first studied Achlorhydria is present in about three quarters of the patients Roentgenologic examination may be difficult because the patient has trouble swallowing barium suspension In about half the cases the esophagus is found to be normal roentgenologically and in the rest there is diffuse spasm and irritability through the distal half Endoscopically one finds atrophic pharyngitis and mucosal atrophy of the proximal one third of the esophagus The mucosa appears dry and glazed There may be more hyperemia than one might guess the degree of anemia would allow Chronic atrophic gastritis is frequently found upon gastroscopic examination

Treatment is easy and the results excellent The purpose is merely to make up for the iron and vitamin B-complex deficiencies Although iron is the specific deficiency thiamin and riboflavin seem very important too Dysphagia usually renders oral medication difficult for the patient at the start and parenteral medication is often desirable for a while A blood transfusion offers quick symptomatic help in most cases

EXTRINSIC MECHANICAL INFLUENCES

The esophagus courses along and across many structures which are able to distort it by enlargement or displacement Except at its upper and lower parts the esophagus is quite mobile within the mediastinum however and unless external pressures encircle the organ they tend to move it rather than compress it In many cases particularly those involving enlargements of portions of the heart the esophagus seems to suffer very little

Cervical osteophytes which have been mentioned above as hazards to endoscopy (Fig 18) can produce troublesome dysphagia by pressing against the posterior aspect of the hypopharynx and cervical esophagus Through irritation they may lead to web formation Cervical vertebrae C 6 and C 7 are most often affected Rarely exostoses of the lower thoracic vertebrae T 8 through T 11 cause symptoms by impingement against the esophagus

Many types of *mediastinal mass* may cause displacement and rarely compression of the esophagus primary and metastatic mediastinal tumors and cysts posttraumatic mediastinal hematomas pericardial cysts aneurysms lung tumors and intrathoracic goiters *Constricting processes* which may operate in this role include postirradiation mediastinal fibrosis postsurgical fibrosis displacements following pneumonectomy and pleural effusion and paraffinomas secondary to therapeutic paraffin atelectasis There are many others that one can think of and that will be encountered from time to time Esophagrams may help considerably in diagnosis of the primary disease

CARDIOVASCULAR ANOMALIES AND DISEASES

As far as the esophagus is concerned anomalies of the aortic arch system may become of clinical importance either early in infancy or not until later adult life Delay in appearance of esophageal compressive effects is explained by the fact that the diameter of major arteries normally continues to increase after neighboring structures have attained maximum size Many types of anomaly may produce esophageal compression although most are more apparent roentgenologically than symptomatically Thus right sided aortic arch produces a deep impression in the esophagus just the reverse of normal and a ductus arteriosus sometimes is responsible for a deep and narrow pressure defect below the aortic arch impression but neither produces deglutitory problems Certain anomalies do however and the most common of these is arteria lusoria

An arteria lusoria is an aberrant right subclavian artery which arises as the fourth branch of an otherwise normal aortic arch It passes posteriorly and to the right behind the esophagus before continuing towards the

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are produced Displacement is always very wide before esophageal compression is produced In an occasional patient the common aortic changes which are produced by hypertension and arteriosclerosis are sufficient to cause dysphagia

The esophagus is more helpful in the diagnosis of acquired enlargements of the heart s chambers than affected by them Esophageal fluoroscopy is an important part of cardiac evaluation In left atrial enlargement the lower half of the esophagus as viewed in the anteroposterior projection is found to be flattened and pushed to the right in a gradual broad curve The curve straightens some on deep inspiration In the lateral projection the lower half of the esophagus may be displaced posteriorly beyond the shadow of the spine When the right atrium is enlarged the lower third of the esophagus is shifted in a gradual curve to the left Sometimes quite atypical pictures are produced

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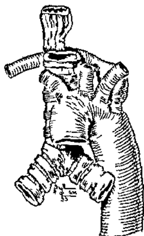


FIG 23 Arteria lusoria arising as the fourth branch of the aortic arch and passing posteriorly to compress the esophagus The *little dilatation just above its take off from the aorta is the diverticulum of Kommerell*

right shoulder (Fig 23) This is the most common anomaly of the aortic arch system the incidence *being reported as from 0 6 to 1 8 per cent at autopsy* Frequently it is associated with other vascular anomalies The dysphagia it may cause by esophageal compression is called dysphagia lusoria (Fig 24) Dyspnea lusoria is the term applied to symptomatic tracheal compression *when that* occurs Dysphagia lusoria *is very much less* common than arteria lusoria If there are no problems during infancy the patient ordinarily is not aware of trouble until mid adult life Subjective illness may be most disabling this being due largely to chronic panic and fatigue Discussion and explanation may be helpful to the patient Resection of *the* aberrant artery root is an effective procedure but less radical efforts directed at educating the patient regarding the nature of his illness are desirable first

Aneurysms of the aortic arch push the *esophagus to the right and either anteriorly* or posteriorly depending on the location of the lesion along the root and arch The ascending aorta and arch are *most* frequently involved and *whenever these parts* are enlarged the esophagus must necessarily be affected When multiple aneurysms exist along the course of the thoracic aorta remarkably bizarre esophageal configurations

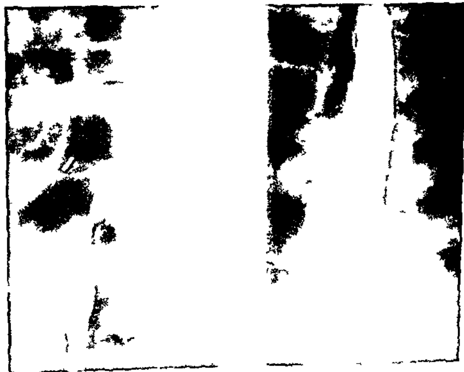


FIG 24 Characteristic roentgenologic deformity produced by an arteria lusoria in a patient with moderate dysphagia lusoria

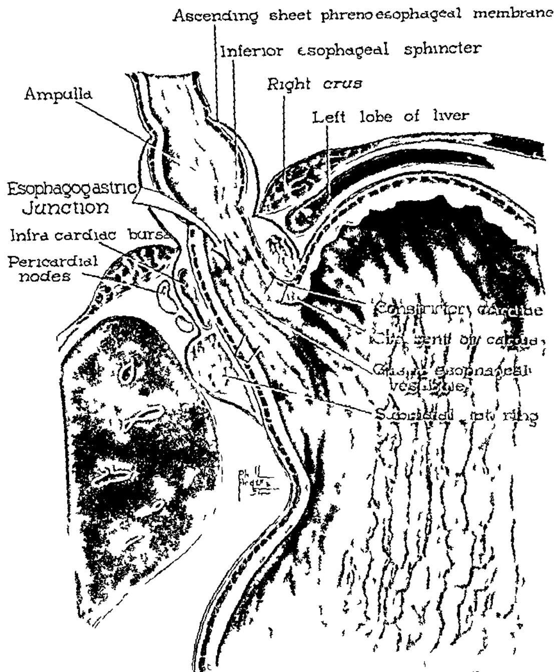


FIG 25 Concept of the anatomy of the normal esophagogastric junction as it exists during life based on roentgen endoscopic and dissection studies

who first defined morbid anatomy could find nothing unique in the region

The anatomy of the esophagogastric junctional area is shown in Figure 25 based on dissection and roentgenologic and esophagoscopic observations This is partly physiologic and partly static anatomy Whatever external appearances seem to be any part of the gastrointestinal tract which is lined with gastric mucosa continuous with that of the stomach proper must be considered stomach because it functions as stomach and be

CHAPTER 4

CARDIA AND DIAPHRAGM

INTRODUCTION

It is no longer possible to discuss upper gastrointestinal diseases merely in terms of *esophagus and stomach* The *junctional* area vaguely but satisfactorily termed the cardia has during the past 10 years been shown to be a unique anatomic and physiologic organ complex in its own right As must be expected when a region of the body suddenly comes into intensive investigative focus there are at the moment a great many unsettled matters and outright disagreements among observers who are reporting on physiologic activities in the region These disagreements serve the very practical function of assuring continued interest in and study of this newly discovered region of the body Facts are still rather difficult to come by To the clinician some of the questions may not seem very important for they revolve about semantic things but big dividends will eventually accrue for better understanding of such regional diseases as ulcer carcinoma and hiatus hernia The esophagogastric junctional area is not a hard area—it is merely new—and clinical security does not need to wait on investigational maturity

Clinical problems of the cardia are largely anatomic and physiologic problems Some have an esophageal flavor and some a gastric but most have neither It might be proper to rewrite the anatomy books and define a separate organ between the ampulla and the gastric sac If an explanation is needed for considering this at such a late date it is that the special characteristics of the cardia become apparent only when it is observed in the living state and interest in studying the region roentgenologically and endoscopically is rather new All of the features which make this a distinct organ complex are lost at the time of death Those

and in some it can easily be demonstrated one day but not the next

The nature of the closing mechanism between the stomach and the esophagus remains a little in question but several features have been generally accepted There is no anatomically specialized muscle sphincter in the region and instead most or all of the vestibule seems to act as a weak sphincter Discouragement of reflux from the stomach into the esophagus does not depend on sphincteric activity however but on the simple valve provided by the oblique angle of junction between the stomach sac and the vestibule This is known because fluid can be squeezed from stomach into esophagus only with difficulty at autopsy The junctional angle seems to depend for its integrity partly on the sling muscle fibers of the stomach which course upward on the lesser curvature and decussate in the crescent of the cardia

DIAPHRAGMATIC HERNIAS

Herniation of part of the stomach through the diaphragmatic hiatus by far the most common of the diaphragmatic hernias is one of the most important of the mechanical gastrointestinal diseases For many years there has been active interest in the anatomy of the defect its surgical correction the clinical aspects as they create a problem in differential diagnosis and the possible influence of the defect on physiologic responses of the heart and coronary vessels A problem of definition arises from the fact that the orad limit of the stomach lies proximal to the brink of the stomach sac If one defines the beginning of the stomach as the point at which gastric mucosa begins as seems proper then it may well be that the production of a hiatus hernia is from time to time a normal phenomenon Probably a degree of transhiatal migration of the gastric muco a occurs in everybody during vomiting and other straining maneuvers even though the sac of the stomach remains in the abdomen and the diaphragmatic hiatus remains competent This is however an anatomic not a clinical definition and it does not differentiate between health and disease For clinical thinking it is necessary to consider migration of part of the stomach sac proper above the diaphragm as the *sine qua non* for the diagnosis of hiatus hernia Even at that it must be understood that hiatus hernia like so many other mechanical defects of the gastrointestinal tract causes illness in only a portion of the people it affects The diagnosis of hiatus hernia is not synonymous with disease

TYPES AND ETIOLOGY

The following is a useful classification of the diaphragmatic hernias Its usefulness is largely that of completeness Some forms are extremely rare The simple spontaneous hiatus hernias create by far the largest part of the problem

- I Diaphragmatic hernias
  - A Nontraumatic lesions
    - 1 Congenital
      - (a) Pleuroperitoneal (foramen of Bochdalek)
      - (b) Esophageal hiatus
        - (1) Paraesophageal
        - (2) Esophageal hiatal
        - (3) With congenitally short esophagus
      - (c) Anterior substernal (foramen of Morgagni Larrey)
      - (d) Gaps in or partial absence of the posterior portion of diaphragm
    - 2 Acquired nontraumatic
      - (a) Esophageal hiatus
        - (1) Pulsion type similar to paraesophageal
        - (2) Pulsion type similar to esophageal hiatal
      - (b) Short esophagus secondary to cicatricial contraction
      - (c) Through fusion lines of diaphragm anlage
      - (d) At other sites named under congenital type
  - B Traumatic lesions
    - 1 Indirect injury
      - (a) Points of embryologic fusion

cause it is susceptible to the diseases of the stomach It has been found that part or most of the "abdominal esophagus is actually stomach and that therefore normal stomach configuration includes a tube like extension at the cardia This is a matter familiar to the esophagoscopist who is used to encounter ing gastric mucosa as soon as the hiatus is traversed The esophagogastric mucosal junc tion normally undergoes rhythmic migration back and forth with an excursion of 2 or 3 cm quite independently of swallowing activity and of the degree of gastric dilata tion Generally however as the stomach becomes filled during a meal the tube of gastric mucosa is drawn down to be taken up by the enlarging sac of the stomach Thus too the region s gross configuration must be dissociated from definition of the stom ach s limits The rare instances in which the lower half or more of the esophagus is lined with gastric mucosa are strictly anomalous

The area covered by the migrating esopha gogastric junction is the gastroesophageal vestibule This is a part of the tube which behaves quite differently from the esophagus This has been discussed under the subject of achalasia a disease whose pathophys iology appears to be associated directly with this difference The important point is that in some of its neurologically and pharma cologically activated motor functions the circular muscle of the vestibule responds in an opposite fashion to that of the body of the esophagus The vestibule is bounded by physiologic sphincters the constrictor cardiae below and the inferior esophageal sphincter above The latter separates the vestibule from the ampulla The ampulla a physiologic dila tation is entirely intrathoracic the level of the inferior sphincter lying a centimeter or more superior to the hiatus when the organs are at rest (Fig 26) The spatial relationship of the esophagogastric junction to the hiatus however shows continuous variation through the phases of respiration The hiatus is merely a hole in the diaphragm for the passage of the alimentary tube and little else It has very little to do with the action of the cardia The same is true of the diaphragmatic crura which appear to impinge on the cardia only when it is distended at the termination of deglutition

Competence of the cardia is a rather re markable mechanism proving among other things a relative necessity for physiologic living In spite of the minor vacuum in which



FIG 26 Normal esophageal ampulla Note the position of its lower limit in relation to the diaphragmatic profile and gastric fun dus

the esophagus finds itself and the large pres sures which may be exerted upon the stom ach food and fluid easily pass into the stomach but can return only with some dif ficulty The competence is only relative however and nothing much is gained by dividing patients into those who at fluoroscopy regurgitate barium suspension into the esoph agus and those who do not This phenomenon can frequently be seen in normal persons

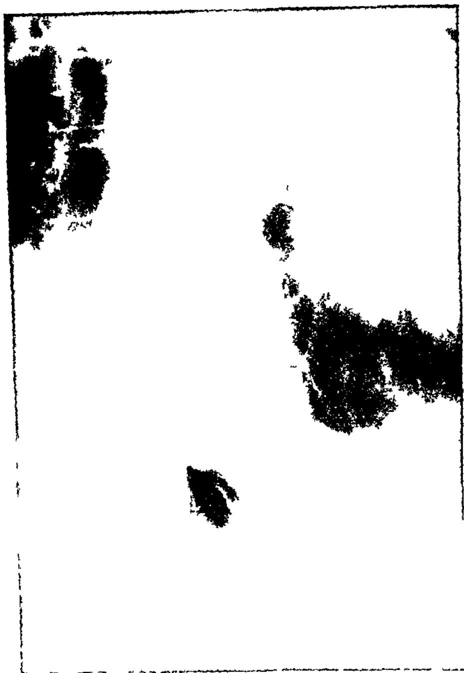


FIG 28 Direct esophageal hiatus hernia without anatomic complications

wonders why they are not more common The diaphragm is formed from the septum transversum the fused leaves of the ventral mesentery mesoderm derived from the Wolffian body and the posterolateral pleuroperitoneal folds There would seem to be lots of areas of relative weakness in the complicated fusion processes In addition the gastric anlage commences its descent into the abdomen after the septum transversum begins to move from the cervical area towards its final position as the diaphragm Normally the former must overtake and pass the latter but if it is slow part of the stom

(b) Dome and posterior half of diaphragm
(c) Other sites
2 Direct injury
(a) Any point in diaphragm
3 Result of inflammatory necrosis
(a) At sites determined by subdiaphragmatic abscess or drainage tubes
II Eventrations (variations are largely quantitative)

the cardia migrates through the hiatus The cardia itself is relatively unaffected by the defect although it rarely remains below the diaphragm

The most common type of hernia is the esophageal hiatal type in which there is transdiaphragmatic displacement of varying amounts of cardia and stomach through an incompetent hiatus (Fig 28) The esophagus may be either so congenitally short or so contracted through cicatrization that the her

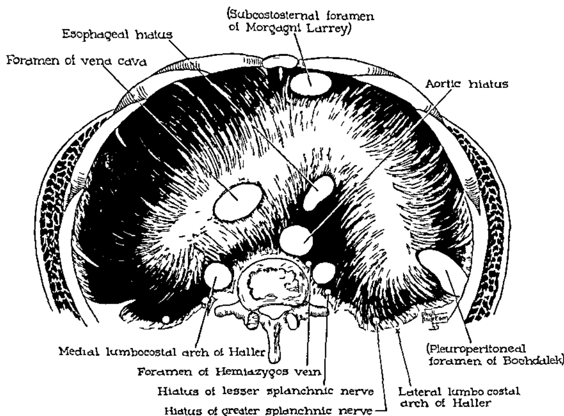


FIG 27 Foramina of the diaphragm normal and abnormal as viewed from below

Most of the forms are self explanatory The various gaps in the diaphragm through which herniation may occur are shown in Fig 27 The foramen of Bochdalek is the hiatus pleuroperitonealis The foramen of Morgagni Larrey lies between the muscle fibers which insert on the xiphoid process and those which insert on the cartilage of the seventh rib In the paraesophageal type of hernia which may be congenital or acquired a part of the gastric wall close to

nia is a permanent one or the displaced organs may easily slide back to their natural position if the thoracico abdominal pressure gradient permits This is the sliding hernia which may be either congenital or acquired Eventrations are not hernias at all but they must be thought of in connection with diaphragmatic hernias because of certain similar mechanical problems (Fig 29)

The etiology of the congenital types is not hard to understand and in fact one

important than these is merely weakness of the hiatal edges which are formed by the splitting of the right diaphragmatic crural muscle

It is probable that true congenital shortening and cicatricial shortening of the esophagus are rare abnormalities and that direct hiatus hernias are almost always associated with an esophagus which is merely tonically contracted If given a chance as when one of its ends is severed the esophagus shows remarkable ability to contract longitudinally The longitudinal muscle layer is endowed with ability to maintain constant tonic contraction as is well known to any thoracic surgeon who resects 8 cm of the esophagus and then finds that his pathologist reports on a segment only 3 cm long If part of the stomach rises through the hiatus the esophagus takes up the slack readily and its course remains straight

The tonic quality of the longitudinal esophageal muscle layer which ordinarily is able to exert itself only when the cardia is elevated also may occasionally have primary etiologic implications In some experimental animals reflex shortening of the esophagus with elevation of the stomach to and sometimes through the hiatus can be induced by irritation of the peritoneum distention of the gallbladder or cystic duct and stretching of the stomach This reflex may have a vagovagal basis The importance of the observation lies in the fact that very frequently in hiatus hernia patients a possible focus for initiation of such a reflex exists—cholecystitis ulcer etc

INCIDENCE AND CLINICAL CIRCUMSTANCES

From series to series it has been found that from 3 5 to 16 0 per cent of patients studied roentgenologically because of upper gastrointestinal complaints have a hiatus hernia Among general hospital patients hiatus hernia is second only to duodenal ulcer as the most common disease found by x ray examination of the esophagus stomach and duodenum There are no sex or it is believed racial preferences Hiatus hernia becomes of clinical importance either during the neonatal period or during midadult life No type of body habitus is especially characteristic of patients with acquired hiatus hernia but obesity is a common associated physical finding

The usual causes of traumatic hernias are crushing accidents and gunshot wounds Very often the first type is sustained on the highways in railroad yards or about heavy machinery In injuries of seemingly catastrophic proportions such as being caught in a stone-crusher a ruptured diaphragm is sometimes the only important injury More often other damage is so severe that the hernia is a relatively minor consideration

ASSOCIATED DISEASES

When hiatus hernia is found in a patient with dyspepsia it is particularly important that the hiatus hernia not be immediately seized upon as the explanation for the illness The gastroenterologist is more likely to encounter other abdominal disease in his hiatus hernia patients than in any other group This is mostly due to the fact that only a small proportion of hiatus hernias are responsible for symptoms most being discovered by accident during search for other disease and partly due to the possibility as stated that hiatus hernia in some cases may be secondary to certain other abdominal diseases The diagnostic hazards are obvious

The common associated lesions are chronic cholecystitis diverticulosis of the colon small bowel diverticula duodenal ulcer gastric ulcer irritable colon and chronic pancreatitis There is some suggestion that gastric carcinoma and esophageal carcinoma are rarer than would be expected on the basis of chance in patients with hiatus hernia but if this is so no possible explanation can be offered

A remarkably common grouping of diseases is Saint s triad—hiatus hernia cholelithiasis and diverticulosis coli (Fig 30) The importance of the triad lies partly in its ubiquity and partly in the fact that its component lesions may at times individually



FIG 29 Eventration of left leaf of diaphragm discovered upon routine chest film of healthy man

ach becomes trapped in the thorax producing a congenitally short esophagus with a fixed and ordinarily large hernia

Acquired hiatus hernias which are not due to trauma are largely the result of laxity of the hiatus In addition to the normal thoracico abdominal pressure gradient abnormal increases in abdominal pressure add to the strain upon a relaxed hiatus Obesity and pregnancy appear to encourage herniation although the growth of intra abdominal tumors usually does not Occupations which call for frequent sustained straining efforts may predispose to herniation At the hiatus itself it is thought that persistence of the infracardiac bursa may promote laxity Anchoring membranes in the region include the pleura peritoneum and ascending and descending sheets of the phrenoesophageal membrane The phrenoesophageal membrane is an extension of the diaphragmatic fascia and must be stretched if a hiatus hernia is to form The peritoneum must also be stretched but this offers little resistance More

but in certain other animals no such effect can be demonstrated Similarly in some reported series of angina pectoris patients the incidence of hiatus hernia has been very high and in others very low The clinician s responsibility is to individualize each case and study both organs separately for whatever disease is demonstrable No clinical application can yet be made of any association which may be suspected between disease at the cardia and decreased myocardial perfusion The clinician must treat the two separately He cannot recommend surgical repair of hiatus hernia with the expectation that the coronary circulation will be improved thereby

CLINICAL PICTURE

Congenital diaphragmatic hernia in the newborn occasionally produces a frightening degree of respiratory and circulatory disturbance Although by the time of birth the normal thoracic structures may seem well accommodated to the presence of the abdominal organs among them occasionally the abnormal mass may prevent expansion and aeration of the lungs The signs are likely to be those of both respiratory insufficiency and heart failure

In the adult as stated only a portion of spontaneous diaphragmatic hernias become responsible for symptoms Small hiatus hernias are as a rule productive of more severe symptoms than large ones This is an important clinical point because naturally small ones are more difficult to demonstrate they are more likely to evoke an attitude of disinterest in one s surgical colleagues and they are more difficult to correct satisfactorily

The important symptom is epigastric or low substernal discomfort usually described with difficulty by the patient This is in contradistinction to symptoms produced by disease of the esophagus proper which the patient can ordinarily describe in precise detail The discomfort sometimes radiates upward producing the sensation of pyrosis but more often it remains at about the xiphoid level usually a little to the left and has a dull oppressive quality In this regard it may closely simulate the pain of myocardial ischemia In an occasional patient a small hiatus hernia is responsible for frightening attacks of chest pain and collapse from time to time The picture may be very similar to that of myocardial infarction and for a day or so there may be minor changes in the electrocardiogram The heart is blamed for many manifestations of small hiatus hernias

Aggravation of the discomfort by straining and recumbency is a feature that is more likely to be encountered in textbooks than in patients It is not a good differential point for suspecting the diagnosis But this is an illness due to a mechanical fault and posturing of one sort or another can be expected to influence the severity of the symptoms in a portion of cases

Regurgitation is a common symptom It is not to be confused with pyrosis which is not unusual in hiatus hernia but which is merely a rising substernal burning sensation without elevation of gastric contents Regurgitation is common after meals and occasionally upon recumbency Pulmonary complications seem to be an unusual sequel in hiatus hernia patients for reasons which are not clear Excess gas and belching are common although not particularly bothersome symptoms Gas distention is at least partly responsible for the discomfort There is no dysphagia in the uncomplicated case

Physical examination is not very helpful in establishing the diagnosis Occasionally when a large portion of the stomach lies above the diaphragm gastric borborygmi may be heard high in the chest permitting suspicion of diaphragmatic hernia Swallowing sounds are regularly abnormal although not necessarily absent They tend to be prolonged continuous and mixed with borborygmi

Traumatic hernias produce quite a different clinical picture ordinarily Because they are likely to be large involving transdiaphragmatic shift of perhaps several organs and because they develop suddenly respiratory

produce the same clinical picture of illness Approximately one of every six patients with hiatus hernia has or will eventually develop Saint s triad If a patient with hiatus hernia is found to have one of the other two lesions the chances are excellent that the third is also present The elements of the triad may develop at different periods during the pa

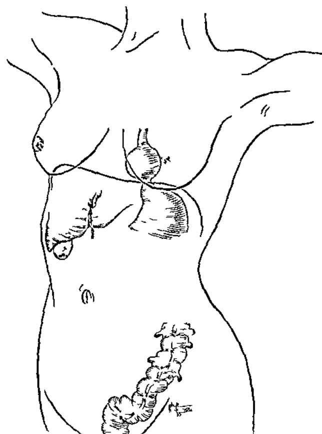


Fig 30 Saint s triad—hiatus hernia cholelithiasis and diverticulosis coli

tient s life so that study at one time might permit prognostication of later disease

Saint s triad is especially interesting in exemplifying the rule that the clinician must remain skeptical of accepting one demonstrated entity as the explanation for the poorly studied patient s troubles Often gall bladder disease is the first to be suspected first to be sought for first to be found and first to be treated In these patients the symptomatic help afforded by cholecystectomy is often poor and apparently the gall bladder disease is rather infrequently the major cause of the patient s illness Usually the problem created by Saint s triad is not that of determining which one of the three lesions is responsible for the symptoms but how much relatively each is contributing to the total picture of illness

It is not clear how much influence a hiatus hernia may have over the coronary circulation Coronary heart disease is an important differential diagnostic problem in hiatus hernia and the question frequently arises The incidence of the combined diseases is rather high too and many clinicians believe there may be cause and effect at work One can find convincing evidence in the literature to support his views on the extent to which one may affect the other no matter what they may be Thus traction on the canine gastric wall decreases coronary artery flow

can be diagnosed by roentgenologic examination Approximately 80 per cent of cases of hiatus hernia proved by a combination of all methods can be demonstrated by the radiologist 65 per cent on the first examination The esophageal ampulla may sometimes be mistaken for a hiatus hernia by tyro and experienced radiologist alike (Fig 31) In the differentiation the number and appearance of the mucosal folds which extend through the diaphragmatic hiatus are findings of importance Precise rules about this may be misleading but some radiologists believe that demonstration of more than four folds is good evidence of hiatus hernia Use of Trendelenburg's position plus upward pressure against the abdomen are required for detection of most hernias For optimum mucosal relief study it is often useful to have the patient swallow about 30 *ml* of heavy mineral oil immediately following the heavy barium suspension



FIG 31 Normal esophageal ampulla sometimes difficult to distinguish from hiatus hernia

By esophagoscopic examination one can determine the position of the esophagogastric

and cardiac manifestations predominate This is partly due to destruction of one or both diaphragmatic leaves and partly to displacement of the thoracic organs Dyspnea cyanosis and pain in the chest and abdomen are common The picture is frequently obscured by injury to other major structures

COMPLICATIONS

The clinical importance of spontaneous diaphragmatic hernias lies mainly in their many complications Very often there is nothing to suggest illness until a complication occurs This may involve the stomach or esophagus or rarely except in neonates other intrathoracic structures

The herniated portion of the stomach occasionally becomes incarcerated above the diaphragm and undergoes gangrene and rupture This can happen with any type of hiatus hernia but traumatic hernias are particularly susceptible It constitutes a major catastrophe More common is development of superficial mucosal lesions within the herniated portion presumably as a result of mucosal congestion Erosive gastritis probably occurs frequently but because it is a process which comes and goes quickly its incidence is difficult to determine In perhaps 5 per cent of patients with acquired fixed hiatus hernia chronic gastric ulcer is demonstrable in the intrathoracic portion of the stomach Usually there is only one such ulcer and it tends to develop about half way between the hiatus and the esophagogastric junction

Secondary changes in the esophagus are the most common of all The frequency of subacute erosive esophagitis in patients with hiatus hernia and the significance of the association have been discussed in the preceding chapter This is an important complication not only in its own right but also because the cicatrization of a long continuing inflammatory disease leads to esophageal stricture The common site for stricture is near the superior limit of the ampulla but any part of the lower one third of the esophagus may be involved Approximately 10 per cent of patients with hiatus hernia who come to medical attention have or later develop an esophageal stricture Not infrequently it is the stricture rather than the hernia that is responsible for the symptoms Chronic ulcer of the esophagus may accompany esophagitis and although it is an infrequent complication of hiatus hernia it in turn may be complicated by stricture hemorrhage and perforation

It is clear that hiatus hernia may be complicated by several processes which are able to cause hemorrhage—erosive gastritis gastric ulcer esophagitis and esophageal ulcer Of these esophagitis is the most important Bleeding may be either sudden and massive or slow and silent leading to chronic anemia Approximately 25 per cent of patients with symptomatic acquired hiatus hernia either give a history of hematemesis or are found to have important anemia

DIAGNOSIS

In spite of certain beliefs to the contrary it is important to understand that diaphragmatic hernias and their complications are not necessarily easy to diagnose To be sure occasionally a routine chest x ray film shows clearly that part of the stomach is in the thorax but often enough at autopsy one finds much more disease in the region of the cardia than had been predicted from the results of clinical and roentgenologic examinations The propensity of some hernias to undergo spontaneous reduction is only one of the factors hindering diagnosis This is a difficult area for the radiologist to examine because he cannot palpate or compress the organs The most orad segment of the stomach has the same configuration as has the esophagus a further problem for the radiologist As with so many other diseases and parts of the body one finds that each applicable examination technic has a contribution to make The special technics useful for diagnosis of diaphragmatic hernias and their complications are roentgenology esophagoscopy and gastroscopy

Most but not all diaphragmatic hernias

MUCOSAL PROLAPSE AND INTUSSUSCEPTION

Redefinition of the normal location of the esophagogastric mucosal junction and observation that the junctional line normally migrates spontaneously back and forth over the region of the vestibule have focussed attention on abnormal mucosal shifts at the cardia Prograde prolapse of esophageal mucosa down into the gastric sac is rare and appears to have no clinical importance Occasionally it is associated with hiatus hernia (Fig 32) or with a mucosal tumor of the distal esophagus It can be detected by contrast fluoroscopy

Retrograde extrusion of a cuff of gastric mucosa up into the esophageal lumen is rare too but it is capable of producing esophageal obstruction Temporary incarceration of the displaced mucosa within the esophagus may develop from time to time producing a bizarre clinical picture of rapidly fluctuating obstruction Sometimes the history is less definite than this consisting of no more than episodic epigastric aching pyrosis and occasional vomiting Bleeding from the cuff of

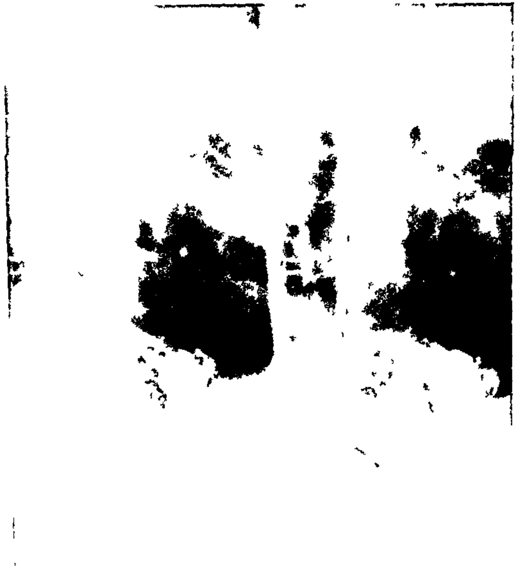


FIG 32 Hiatus hernia accompanied by prograde prolapse of the esophageal mucosa

mucosal junction *much more clearly* than abnormal regional configurations such as the dilatation of an intrathoracic gastric sac The number and configuration of mucosal folds are rapidly changing endoscopic features and are not particularly helpful for esophagoscopic diagnosis The esophagoscopist is able to detect approximately 85 per cent of direct hiatus hernias which are demonstrable by any technic 80 per cent of them on the first examination The patient s straining coincident to the procedure proves optimum for the production of herniation in cases of sliding hernia Paraesophageal hernias cannot be recognized by endoscopic technics

Gastroscopic examination is not an efficient method of diagnosing hernias only about 45 per cent being demonstrable When the instrument is being withdrawn following each gastroscopy, however it pays to insufflate air as the cardia is passed for occasionally an unsuspected direct hiatus hernia is produced thereby One sees a little gastric sac suddenly appear and upon passing the instrument again below the diaphragm he is able to recognize that a hernia has formed

All examination methods are necessary for demonstration of the complications of hiatus hernias Erosive gastritis and many instances of ulcer in the herniated gastric sac can be demonstrated only upon gastroscopic examination Both gastroscopic and esophagoscopic examination are particularly useful for detecting the source of complicating hemorrhage, as will be seen Esophagitis and esophageal ulcer are best searched for esophagoscopically Stricture evaluation requires both roentgenologic and esophagoscopic study

TREATMENT

Only a small proportion of hiatus hernias require treatment Presumably all that bring patients to the doctor do A radical surgical approach is not called for very often although admittedly medical measures give unpredictable and often unsatisfactory results In general indications for surgical repair exist when there has been one of the more important complications particularly hemorrhage esophageal stricture *ulcer of* the herniated portion and esophagitis of long standing Most instances *of traumatic rup*ture of the diaphragm require repair Severity of symptoms by itself is *not an indication* for operation until simple medical measures have been given a trial

The most effective of these simple medical measures are those which help decrease intra abdominal pressure Reduction in weight of obese patients is very important and sometimes cures the symptoms Artificial abdominal supports should be discarded although this may create problems of its own Control of chronic constipation seems important for this specific purpose although not often does the patient believe it helps Some patients have more comfortable nights if the head of their bed is elevated There is no reason to alter the diet or to prescribe medications

The simplest surgical procedure for temporary relief is left phrenic crush If there is question of whether more definitive surgery will help the symptomatic picture this manner of paralyzing the left diaphragm for a few months may be a useful therapeutic test The procedure however does not prevent progression of secondary changes in the esophagus and is only of symptomatic value Transthoracic repair of the hiatus is the operation of choice There are many technical variations If the length of the esophagus will permit the stomach should be replaced in its normal position If it will not length may be gained by making a new hiatus in the dome of the diaphragm Suturing the stomach to the edge of the hiatus is probably desirable if the esophagus has become excessively short with or without permanent left phrenicectomy

Repair of traumatic hernias should be carried out as soon as the diagnosis has been established if the patient s condition and other injuries permit Because of the probability of damage to other abdominal organs the transabdominal approach is usually preferred



FIG 34 Carcinoma of the cardia of the stomach extending up into the esophageal walls

Nevertheless one gains the impression that the ascending sheet normally if not in people with an ampullary contraction ring inserts at the superior limit of the ampulla

The diagnosis is wholly a roentgenologic one (Fig 33) Esophagoscopic examination usually fails to demonstrate the ring and biopsy specimens taken from the ampulla wall in the area show only normal tissue Although of course most instances have been found in people who have complained of symptoms in the region it is questionable whether clinical significance is implied

CARCINOMA AT THE CARDIA

The cardia is a common place for cancer to develop Almost all such tumors are adenocarcinomas and almost all arise in the gastric mucosa There is a question of whether some are primary in the distal esophagus Not long ago it was thought that many were because by the time the tumor could be inspected at operation or autopsy its bulk was found to be about the esophagus while the stomach proper was not much affected With better understanding of the orad limits of the normal gastric mucosa and demonstration that malignant tumors of the fundus and cardia show a strong tendency to extend proximally into the esophagus it has been concluded that one is dealing almost exclusively with a gastric tumor when adenocarcinoma is found in the vicinity of the esophagogastric junction

gastric mucosa may occur Roentgenologic study during *a symptomatic period shows the* obstructing mass but gives no information regarding its nature Esophagoscopically, the plug of gastric mucosa is found to be eroded and bloody appearing much like a tumor gency Preoperative diagnosis has not been *reported* Manual reduction probably is no problem if the symptoms and physical examination lead to early laparotomy Prograde intussusception cannot occur at the cardia because of relative organ diameters



Fig 33 Ampullary contraction ring The ring is best brought out when *the ampulla is in diastole (right) and is not evident after the bolus has passed (left)*

Its nature becomes evident when it is seen to develop a lumen and retreat into the walls of the proximal stomach as it slides caudad ahead of the esophagoscope Treatment consists of dilatation of the cardia preferably with a pneumatic tube The results are good Operative measures are not indicated

Retrograde intussusception of the entire thickness of the gastric wall into the esophageal lumen has been reported only a few times It apparently creates an acute surgical emer

AMPULLARY CONTRACTION RING

An ampullary contraction ring is a rather constant thin symmetrical ring like contraction which partially divides the ampulla in two in some people Certain observers believe that the ring marks the level of attachment of the phrenoesophageal membrane s *ascending sheet This does not seem to be so* but the evidence is not clear Although the membrane s attachment can be demonstrated easily by air dissection at autopsy the ampulla disappears as a structure after death

SINGULTUS

Hiccups can result from stimulation along any part of the singultus reflex arc The afferent impulses are carried by sensory fibers in either the vagus or phrenic nerves Diaphragmatic irritation often by infiltrating tumor or nearby infection and gastric irritation as by sudden distention or sudden cooling are common causes of afferent stimulation The hiccup center is in the medulla near the respiratory and vomiting centers Epidemic hiccup probably represents an aberrant form of epidemic encephalitis with temporary injury to this part The efferent impulses are of course carried by the phrenic nerves and the usual stimulants here are tumor of the mediastinum and pleural inflammation

Most instances of singultus require no special effort at treatment Ceaseless singultus may be an extremely disabling and even dangerous condition Often the cause is unknown and several therapeutic tricks must be tried The well known empirical methods of treatment are sometimes helpful—compression of the eyeballs for half a minute brief carotid sinus pressure induction of vomiting traction on the tongue induction of sudden fright rebreathing in a paper bag and a host of others Gastric aspiration is useful if gastric dilatation is at fault Whatever the cause intravenous chlorpromazine which acts through the medullary center is by far the most effective drug to use for intractable cases It is also useful for the prophylaxis of the singultus of general surgical anesthesia Occasionally these conservative measures do not stop the hiccups and one is forced to block one or both phrenic nerves Temporary cervical phrenic block or block of the third fourth and fifth cervical roots should probably be done after five days if the simpler methods particularly intravenous chlorpromazine have not proved helpful Finally if everything else fails phrenic crush can be relied upon to stop the hiccups

EVENTRATION

The majority of diaphragmatic eventrations (Petit s disease) are encountered by chance Rarely are they responsible for illness The condition is due to idiopathic paralysis of one leaf of the diaphragm usually present since birth Several years ago eventration was often induced as a therapeutic measure for pulmonary tuberculosis and the patients showed no ill-effects Today induction of eventration is one means of treating the symptoms of hiatus hernia Whether present since birth or produced artificially by phrenicectomy the diaphragmatic elevation is easily accommodated by the thoracic contents except for slight reduction of vital capacity

The diaphragm remains intact and is merely immobile and passively elevated as a result of the thoracico-abdominal pressure gradient (Fig 29) It carries with it whatever organs are nearby liver in the case of the right leaf and often stomach spleen and colon in the case of the left The stomach commonly undergoes 180 volvulus in this situation

Partial eventration of the right diaphragm appears to be a distinct entity and it has a slightly different mechanical effect It is a congenital condition and it shows predilection for the anteromedian portion of the right leaf A corresponding deformity of the liver the superior accessory lobe comprises its contents X ray examination of the diaphragm reveals a characteristic hump in the anteromedian aspect of the leaf's profile Pneumoperitoneum shows that there is a deformity in the diaphragm as well as the liver important for excluding liver tumor The symptom of periodic pain in the epigastrium or right chest has been described but is extremely rare

SUBPHRENIC ABSCESS

Like so many infectious processes subphrenic abscess has changed its colors during the past several years It no longer acts as it is supposed to according to the classical descriptions and in general it is becoming more and more difficult to recognize As the result of common utilization of antimicrobial agents following repair of intestinal perforations and for many other abdominal conditions accompanied by actual or threatened

Grossly these tumors are bulky on the surface but show great ability to infiltrate The part which lies in the stomach begins as a sessile lump on a rather restricted deep tumor plaque As the mass enlarges it characteristically extends through the gastric wall and then pushes the gastric cavity down away from the profile of the diaphragm As it infiltrates upward into the esophagus the tumor remains strictly in the intramural position The walls of the distal esophagus become rigid but its lumen is not likely to become occluded for a long time (Fig 34)

The symptom of carcinoma at the cardia is dysphagia By the time it appears there is much tumor in the region Except for obstruction the lesion usually remains silent Late in the course epigastric pain may develop and with invasion of the diaphragm there may be singultus This is a disease in which examination of the swallowing sounds may be especially helpful They regularly disappear as soon as the distal part of the esophagus becomes invaded It is not unusual to find that both roentgenologic and esophagoscopic examinations remain normal for several weeks after routine auscultation of the swallowing sounds has suggested that disease is present

Routine chest x ray films sometimes show the tumor before symptoms develop These are lesions which develop in the region of the magenblase and they can be detected if they infringe on the median portion of the gas shadow (Fig 100) Another useful sign is depression of the upper border of the magenblase below the profile of the left diaphragm A gap of more than a couple of centimeters suggests interposition of tumor It is important to make a habit of scrutinizing the magenblase every time a chest x ray film is examined

Diagnosis depends on roentgenologic esophagoscopic and gastroscopic examinations The radiologic difficulties in this area have been mentioned In addition to filling defects in the gastric fundus and about the cardia stiffness of the terminal esophagus and depression of the fundus are the important signs Gastroscopic examination is not possible if the terminal esophagus is fixed and even when instrumentation is unobstructed it may be that the lesion lies wholly or in part in the fundal blind area It is helpful to carry out the examination with the patient in the sitting position and to use either a gastroscope with controllable flexibility of its tip or the transesophagoscopic rigid instrument with retrograde prism

The most important diagnostic procedure is esophagoscopy with biopsy If the tumor is still confined to the stomach it may be out of the axis of the esophagus and may therefore be inaccessible to esophagoscopic view More often it can be seen and biopsied even though it is down in the gastric sac If the esophageal walls are found to be infiltrated it is not proper to attempt to negotiate the supradiaphragmatic esophageal bend with the instrument Infiltration is evident to the esophagoscopist through mural stiffness The esophageal mucosa remains normal or shows esophagitis Biopsy of the esophageal wall is at times unsuccessful because of the depth of the tumor

Surgical extirpation of the lesion with esophagogastrostomy or a short circuiting esophagogastrostomy may be necessary because of obstruction but this tumor is probably not curable by any presently known method of therapy Metastases spread through the gastrohepatic ligament to the liver early in the course Peroral dilatation with Hurst bougies is only moderately successful Radiation therapy has no value

DIAPHRAGM

The diaphragm is as much influenced by diseases of nearby structures as by its own infirmities It lies in a vulnerable area Its main characteristic is rhythmic muscular activity and an anatomic peculiarity is the long and exposed course that its two motor nerves must take through the mediastinum before making their connections The result is that the diaphragm may become involved by a number of mediastinal pleural and abdominal diseases Many of them do not fall within the gastroenterologist s sphere and cannot rightfully be discussed here

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Like so many infectious processes subphrenic abscess has changed its colors during the past several years It no longer acts as it is supposed to according to the classical descriptions and in general it is becoming more and more difficult to recognize As the result of common utilization of antimicrobial agents following repair of intestinal perforations and for many other abdominal conditions accompanied by actual or threatened

infection subphrenic abscess has become clinically a less acute process The consequence of increasing occultness has of course, been increasing delay in diagnosis and treatment The outlook has not improved

Subphrenic abscess is common on the right side rare on the left The subphrenic space on the right is a favorite site for loculation of infection in any case of bacterial peritonitis Strangely however infection may reach the area and prove to be potent here when clinical peritonitis appears to remain restricted to the infection s source Although bacteria must move through the peritoneal cavity to reach the subphrenic space often they do not stop off to cause trouble along the way The usual sources are acute appendicitis perforated ulcer and acute cholecystitis In sharp contrast to the frequency with which pleural infections follow subphrenic infections is the great rarity with which pleural infection leads to subphrenic abscess The explanation is found in the direction of transdiaphragmatic lymph flow although its notable effectiveness in this role is a bit difficult to understand Most cases which follow pleural empyema are secondary to contamination by a thoracentesis needle It is most *unusual for a liver abscess to lead to subphrenic* abscess because as it approaches the surface of the liver perihepatic reaction leads to hepatophrenic adhesions Rupture of the hepatic abscess then extends directly *through into the pleural cavity or into the* lung substance if the lung too has become adherent

Right subphrenic abscesses are limited by the diaphragm dome of the liver falciform ligament and hepatophrenic adhesions The right diaphragm becomes paralyzed and parts of it may eventrate depending on the amount of the abscess content and the location of adhesions Frequently a right pleural reaction develops often with effusion and the base of the right lower lung *lobe may show atelectasis*

Left subphrenic abscesses are not nearly as closely hemmed in by regional structures and organs and in fact they usually amount to perisplenic abscesses The left leaf of the diaphragm usually becomes paralyzed but infrequently is it elevated

The clinical picture sometimes is merely that of concealed pus without localizing symptoms or signs—septic fever chills sweats and leukocytosis More often on the right side there is pain in the lower chest right shoulder and, occasionally the right side of the neck Cough is common but secondary intrapleural reaction is rarely sufficient to produce respiratory difficulty In left subphrenic abscess the symptoms are more likely to suggest intra abdominal than chest disease Pain is prone to radiate from the left upper abdomen to the left flank and left paraumbilical area, rather than to the chest Left pleural reaction is less common In addition to the symptoms of localized pus manifestations of systemic toxicity are common and often severe —nausea vomiting headache diarrhea mental confusion and prostration

Physical findings may be practically absent *or they may be striking The important point* is that absence of demonstrable signs of trouble in the upper quadrants cannot be used as evidence that subphrenic abscess does not exist Litten s sign is usually absent on the *side of the trouble due to paralysis of the* hemidiaphragm The liver does not descend with inspiration in cases of right subphrenic abscess Intercostal tenderness over the abscess area can sometimes be demonstrated *and sudden compression of* the lower ribs either laterally or anteroposteriorly often produces local pain Guarding in the upper abdomen and mild tenderness which varies in intensity from time to time are sometimes found

Roentgenologic study is sometimes very helpful for diagnosis Fixation of the diaphragm on the affected side elevation or partial eventration on the right and pleural reaction with or without fluid are common *findings (Fig 35) In those* instances in which a gas forming organism is involved gas and a fluid level are found The mass created by a left subphrenic abscess is usually demonstrable when barium suspension is in

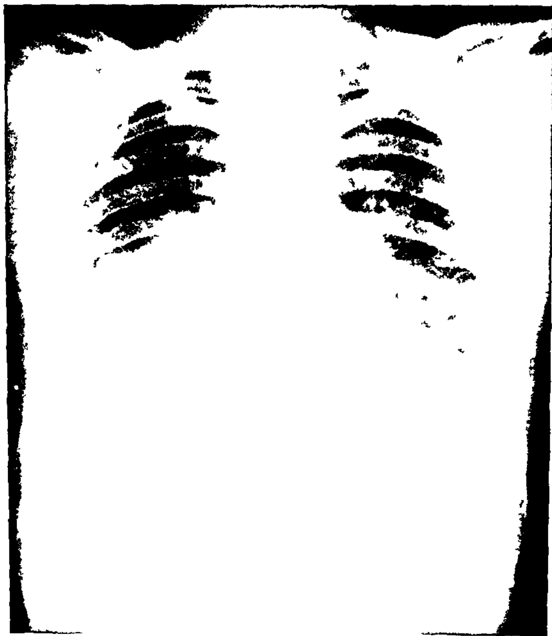


FIG 35 Subphrenic abscess secondary to empyema of the gallbladder The diaphragm is elevated and there is extensive pleural reaction

the stomach and the patient is placed in Trendelenburg s position The interval between the gastric fundus and the diaphragm is increased (Carter s sign)

Treatment calls for surgical drainage and antimicrobial medication as soon as the diagnosis is made Simple aspiration must not be attempted but rather radical open drainage is in order Usually by the time an abscess makes its presence known the source of infection will already have been taken care of—the appendix will have been removed a perforated ulcer closed etc If by chance the primary disease has remained silent this must be sought out and treated appropriately

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CHAPTER 5

THE ABDOMEN IN GENERAL

INTRODUCTION

In this chapter are discussed abdominal matters which do not relate directly to specific viscera Many of the subjects are more likely to be emphasized in textbooks of surgery than in discussions for gastroenterologists No apology is intended The gastroenterologist serves as general practitioner for the abdomen and these subjects are important to him

The technics which are used for investigation of the abdomen and its diseases are the technics of many specialties and in addition to those which he considers his own the gastroenterologist must often depend especially on the methods of the urologist and gynecologist Although in general the many applicable objective approaches are familiar to all or are described elsewhere herein it is thought that there should be comment at this time on the three subjects which follow

AUSCULTATION OF THE ABDOMEN

The multitude of noises which come from the abdomen may give as much diagnostic information as do those from the chest and it is fair to say that the stethoscope is as important as any instrument for examination of the gastrointestinal tract Too often abdominal auscultation is taken to mean listening to bowel sounds but there is much more to it than this Figure 36 shows the important abnormalities to be considered during routine auscultation of the abdomen Sources of sounds may be classified as vascular parietal friction rubs visceral activity and muscular activity

Arterial sounds are contributed largely by aneurysms traumatic arteriovenous shunts and the arterial sounds of the pregnant uterus Partial occlusion of a major artery by extrinsic pressure is practically never a source

of abdominal noise An important venous noise to be sought is the characteristic hum of Cruveilhier Baumgarten disease and syndrome somewhere in the midline between umbilicus and xiphoid This is the significant clinical finding of the condition and upon it diagnosis depends The hum may be localized deep venous collaterals to the deep epigastric vein

Discovery of a peritoneal rub can be most helpful in both detection and localization of lesions which either primarily or secondarily involve the visceral peritoneum Diseases of the spleen and liver are most blatant in this

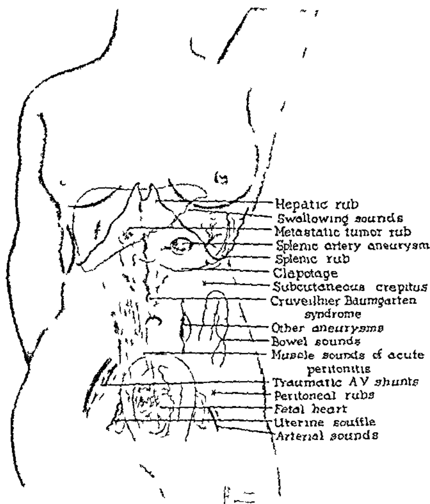


Fig 36 Sources of the diagnostic abdominal noises

to a small area and is easily obliterated and thus overlooked if pressure is exerted by the stethoscope bell At times in portal cirrhosis even when the venous pattern of the abdominal wall shows no prominence a very harsh venous hum can be palpated and heard just lateral and inferior to the umbilicus It apparently represents junctional flow from the connection because their position in relation to the diaphragm provides for protracted excursion against the parietal surface The presence of ascites of even small amount prevents the peritoneal contact which is essential for friction noise Although there are many possible explanations for perihepatitis and perisplenitis tumor is by far the commonest for

the former and infarction and abscess for the latter It is a fairly reliable rule that a hepatoma which reaches the anterior liver surface produces no friction rub while metastatic carcinoma does If a patient is known to have a stomach pancreatic or bowel cancer detection of a friction rub over the liver comes close to proving liver metastasis Rarely does *auscultation permit one to detect friction rubs* originating from the intestinal serosa although bowel tumors which make contact with the anterior abdominal wall can sometimes be heard

Clapotage is the term identifying the succussion splash *which can be elicited in a fasting* patient who has gastric dilatation with retention It can be demonstrated without the help of a stethoscope simply by shaking the supine or erect patient or by tapping over his stomach

The variability of normal and abnormal bowel sounds and the diagnostic significance of different pitches qualities and periodicities are matters which can be understood only after considerable bedside experience The rules do not tell one much but briefly they are as follows During the gastric and absorptive phases of digestion rather regular lengthy gurglings are heard During the fasting state the sounds are louder and briefer In paralytic ileus sounds are absent Early in mechanical bowel obstruction vigorous hyperactive peristalsis can be heard Later when *obstruction is almost complete the pitch* becomes high and a tinkling quality is characteristic

The fibrillary hum produced by contraction of voluntary muscle creates a physical sign which is useful in studying the patient suspected of having peritonitis Both voluntary guarding contraction of the abdominal wall muscles and their involuntary spasm give off a sound of course but in the former case there is more irregularity in its intensity The fibrillary hum of involuntary spasm is monotonous over long periods Palpatory pressure over the tender areas does not much increase the sound s intensity as it does when the patient is voluntarily protecting himself

PERITONEOSCOPY

The technic of endoscopic examination of the peritoneal cavity is more than 50 years old but complete acceptance for general clinical use has never been forthcoming Even though inspection of some parts of the abdomen and pelvis can be better carried out peritoneoscopically than at laparotomy the more direct approach of surgical exploration with its advantages of detailed palpation viscerotomy and perhaps treatment on the spot is preferred by many clinicians Nevertheless peritoneoscopy (celioscopy) has a place in clinical medicine It is a minor procedure It can be carried out without moving the patient from his bed Local infiltration *of the abdominal wall is the only anesthesia* required In addition to inspection the peritoneoscopist can take biopsies and aspirates carry out direct cholangiography and assist direction of a percutaneous biopsy needle to an area of tumor in the liver He is able to visualize the anterior parts of the diaphragm anterior surface of both liver lobes the gall bladder anterior wall of the stomach inferior portion of an enlarged spleen some of the large and small bowel omentum parietal and visceral peritoneum and in the female the internal genitalia Approximately 10 per cent of the examinations are inconclusive and another 5 per cent incomplete or entirely unsatisfactory Largely because the clinician who may at most times disdain the procedure is likely to call for peritoneoscopic help when the patient is too sick to be acceptable to the surgeon the mortality rate is about 0 3 per cent

Peritoneoscopy is carried out with the patient in the supine position The abdomen is prepared as for laparotomy Unless there be interfering scars or suspected adherent structures beneath a point in the midline just inferior to the umbilicus is chosen for anesthetic infiltration and short incision down to the peritoneum A trocar within the instrument s outer tube is passed into the peritoneal cavity pneumoperitoneum is induced by hand bulb and a telescope is substituted

for the trocar Pneumoperitoneum is main tained by additional insufflation as the exami nation is carried out The patient is turned from side to side and tipped into Trendelen burg s position to the extent needed to permit inspection of various organs

DIAGNOSTIC PERITONEAL TAP

Withdrawal of even a small amount of fluid from the peritoneal cavity in both acute and chronic abdominal problems provides material which often gives positive diagnostic help This is a neglected technic, probably because of fear of injury to the bowel or other structures Actually it is a very safe technic although it requires of the doctor solid knowledge of the regional anatomy of the abdominal wall and underlying structures Even a fine needle can hardly pierce bowel which is not fixed and if by some chance it should not much harm results

A long # 18 gauge needle and small syringe are used The patient lies at the edge of a table or his bed partly rotated upward from the prone position so that most of the ab domen is exposed The site of aspiration is *the same as for ordinary paracentesis The* regions of the bladder solid organs masses abdominal wall scars and inferior epigastric vessels are avoided Because often there is little increase over the normal amount of free peritoneal fluid positioning of the patient according to the site selected for aspiration is important Even when no fluid appears in the syringe the amount that the needle itself contains may be sufficient to give important information and at least a smear and culture can always be made

The characteristics of aspirated fluid in various diseases will be mentioned as the discussion progresses In the way of generali ties it may be noted that transudative fluid has a specific gravity of less than 1 015 while an exudate is denser and more turbid Hem orrhagic fluid usually indicates intra abdomi nal tumor tuberculosis trauma an acute mechanical problem or disease of hemostasis but occasionally it is encountered in uncom plicated cirrhosis *The amylase* activity of material obtained by peritoneal aspiration is *considerably greater than that of the serum* in cases of acute pancreatitis and it remains elevated from two to four days longer Be cause it is elevated also in several other acute abdominal conditions a high value is re quired before it can be considered significant for the diagnosis of acute pancreatitis Cul *ture of fluid for common bacteria is an im* portant routine If the culture is positive but the material is a transudate significant infec tion is not necessarily implied Presence of gram negative rods suggests perforation of the appendix or large bowel In the ascitic form of tuberculous peritonitis as opposed to the plastic type fluid is readily obtainable to demonstrate the organisms it must be cul tured or inoculated into guinea pigs for they cannot be found on simple smear Cytologic study of specially prepared smears and histo pathologic examination of cell blocks ob tained by centrifugalization may permit a diagnosis of intra abdominal malignancy and occasionally suggest the source or type of the tumor

ABDOMINAL WALL

It is easy for the clinician in his autom atism to think first or only of the viscera when pain in the abdominal area presents itself It may be true that detection of trouble in the abdominal wall as the cause of ab dominal symptoms is largely a matter of awareness but in clinical practice the matter is not as simple as this The cerebrospinal nerves which supply sensory innervation for the abdominal wall also supply it for the pari *etal peritoneum the lesser omentum and the* mesenteries to within a centimeter or so of the small and large intestines Obviously dif ferentiation of a pain source which is irritat ing the inner surface of the parietal peri toneum from one which is irritating its outer surface may be very difficult

The main characteristic of pain which arises in either the parietal peritoneum or within the rest of the abdominal wall as op posed to pain of visceral origin is its accu rate somatic localization Although the pain

of spinal nerve root diseases—always an important differential consideration in this problem—may be referred onto the abdominal wall there are fortunately specific spinal radiation patterns and specific manipulations relaxed and then with the muscles voluntarily contracted Contracted muscles protect the intra abdominal area from the pressure of palpation but a superficial tender area is made more tender to palpation

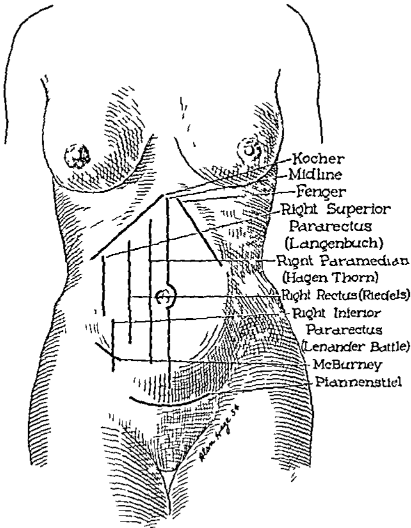


FIG 37 The classical abdominal incisions

for proving paraspinal origin of the stimulus Fortunately too the majority of diseases which irritate the parietal peritoneum are intra abdominal ones and most painful diseases of the abdominal wall lie too superficially to contact the peritoneum Thus since the abdominal wall s muscle layers usually separate the two they may often be differentiated by palpating the painful area with the abdomen

MECHANICAL DEFECTS

Many of the mechanical defects of the abdominal wall are easily diagnosed and raise no differential diagnostic problems Umbilical hernia (omphalocele) is the commonest congenital defect of the wall and, in addition it may be acquired either during the first two years of life or much later during adulthood In the latter instance pregnancy obesity and

INTRA ABDOMINAL FLUID

ASCITES

Ascites can be a manifestation of a great variety of abdominal and generalized dis eases and the fluid may be either a transu date or an exudate An exudation is easily understood but not so with a transudation The cause for accumulation of a transudate can be assumed to be a complex matter For one thing the composition of the fluid is not entirely similar in renal cardiac hepatic and nutritional ascites Thus the ascites of cir rhosis appears to represent essentially an isotonic expansion of extracellular fluid in contrast to that of congestive heart failure which is a hypotonic expansion of both intra cellular and extracellular fluids Nevertheless it is safe to say there is some final common pathway Increase in portal pressure is known not to be very important in encouraging peri toneal transudation unless portal occlusion be sudden because the great majority of pa tients with portal hypertension due to extra hepatic portal block have no ascites When ascites does accompany portal hypertension its presence is usually explained by concom itant liver disease Reduction of the colloid osmotic pressure of the plasma secondary to failure of the liver to maintain albumin concentration is believed to be one of the factors which encourage transudation This plus the proved permeability defect of the capillary endothelium could not play a signi ficant role in the case of cirrhosis if in truth the ascites of this disease does repre sent part of a general isotonic fluid expansion In considering the apparent absence of static gradient influences it is interesting to note that tracer studies have shown that albumin circulates back and forth between blood stream and ascitic fluid remarkably quickly to the extent of about four per cent of the serum albumin per hour

Some of the observations and speculations about ascites production which revolve around the influences of electrolyte disturbances en docrine influences and perhaps an indepen dent circulating antidiuretic substance can be brought together by focusing on aldosterone So far study of this hormone or polyglot hormone is in its infancy but its potential implications are already evident Aldosterone an adrenal steroid once known as electro cortin appears to be identical to the sodium retaining factor which is absent from the urine of persons with hypoadrenocorticism and present in increased amounts in the urine of people with lipoid nephrosis con gestive heart failure cirrhosis and pos sibly most or all diseases associated with water retention It causes conservation of sodium and chloride and encourages excre tion of potassium It inhibits activity of the hypophysis It is unquestionably important to the formation of ascites although not necessarily by itself Further one cannot go at this time in discussing etiology

The normal adult peritoneal cavity is be lieved to contain from 100 to 200 ml of fluid When in disease the amount increases it makes room for itself by developing pres sure which can influence the positions only of the diaphragm and anterior abdominal wall Respiratory difficulty feelings of pres sure and heaviness and increased girth are the usual complaints In such diseases as acute necrosis of the liver and acute throm bosis of the hepatic veins fluid may pour into the peritoneal cavity very rapidly In others a remarkable balance between fluid absorption and production is often attained so that the amount of ascites remains un changed over a period of many months or years Treatment by paracentesis is indicated only for relief of respiratory troubles and of excessive pressure symptoms In any patient with chronic ascites producing disease relief is ordinarily short lived Waste of protein and electrolytes by removal of ascitic fluid is a factor to be reckoned with As a general rule one should be conservative in relieving a patient of his ascitic fluid by drainage Spontaneous rupture of an umbilical hernia which is secondary to ascites is a rare com plication usually due to the pressure of an abdominal binder Because of the danger of peritoneal infection this is a dangerous

lapsing febrile nodular nonsuppurative panniculitis The disease is characterized by recurring episodes of fever with the simultaneous appearance of inflammatory or necrotic nodules in the panniculus adiposus Nodules are most frequent over the abdomen arms legs and breasts They range from 1 to 3 cm in diameter Regional adenopathy and splenomegaly occasionally develop All age groups are affected About 75 per cent of patients are females The disease has not been reported in Negroes There is neither satisfactory etiologic explanation nor satisfactory treatment

There is a systemic variant of Weber Christian disease characterized by development of the nodules in the subserosal position over scattered abdominal organs It is too poorly known to permit generalities but appears to be a valid entity There is the possibility that intra abdominal lesions occur in the classical form of the disease too although the opportunity to explore the peritoneal cavity in this disease rarely presents itself

URACHAL DISEASE

The urachus is a musculotendinous structure lying between the transversalis fascia and peritoneum from the apex of the bladder to the umbilicus or part way to the umbilicus Although it is a urologic structure the gastroenterologist often is first to see the patient with urachal disease Whenever lower abdominal symptoms are associated with umbilical complaints the possibility of urachal disease must be considered

When the urachus is patent the tract from bladder to umbilicus may be open or it may be patent at only one end or the other Exstrophy of the bladder is the extreme form of the anomaly Sometimes there is a persistent omphalomesenteric duct Simple retention cysts may form along the length of the urachus and calculus formation is the possible sequel Often infection then supervenes Abscess is the commonest clinical problem whatever form the abnormality may take Mucinous carcinoma may be primary in the urachus Tuberculosis and actinomycosis have been reported in the literature many times

The complaints which bring the patient to the doctor are almost always those of infection presenting as lower abdominal pain and tenderness Often there is a suprapubic mass with drainage from the umbilicus Most cases of urinary drainage from the umbilicus however are not instances of urachal disease but represent failure of closure of the bladder s upper end secondary to lower urinary tract obstruction (vesico umbilical fistula) Treatment is a matter of surgical excision or repair depending on the nature of the lesion s anatomic associations In order to determine this retrograde urographic study is necessary

HYSTERICAL ABDOMINAL PROPTOSIS

This is a condition which is related in some ways to pseudocyesis as a type of abdominal enlargement without increased volume of the abdominal contents manifest on certain occasions and absent on others It is a startling clinical phenomenon One does not encounter genuine cases often but each patient is likely to remain long in memory

The important manifestation is rather sudden swelling of the abdomen which may persist for minutes hours or days with varying degrees of discomfort Examination of the enlarged abdomen shows no excess gas The leaves of the diaphragm however are unusually low in the chest even during expiration Exaggerated lordosis is often evident Radiologic examination shows normal amounts of normally distributed gas Subsidence is spontaneous and may be rapid As the abdomen shrinks no gas is lost The lordosis disappears and the leaves of the diaphragm return to their normal positions

The condition can be said to be a hysterical phenomenon rightly enough The usual mechanism seems to be merely contraction of one or more portions of the musculature of the abdomen s walls and roof with relaxation of anterior and lateral muscles Depression of the diaphragm and lordosis are most often the important alterations Treatment is best entrusted to the psychiatrist

there be occlusion of the foramen of Winslow the air passes quickly into the greater sac so that roentgenographic study seldom permits confirmation of lesser sac involvement In addition to actual instrumental perforation air may on rare occasions pass through the apparently intact gastric wall in some mysterious way during gastroscopy No reasonable explanation has been offered but the most careful study of the stomach at laparotomy in such cases fails to show rupture

As little as 10 ml of air in the right subphrenic space can at times be detected roentgenologically It is important that the patient be kept in the position for filming whether it be upright or left lateral decubitus for at least 20 minutes before the film is taken to permit dispersed air to collect Small quantities of air may be absorbed by the peritoneum within 24 hours As judged by roentgenologic study 14 days may be required for absorption of quantities in excess of 1200 ml

ABDOMINAL ANALOGUES OF CERTAIN GENERALIZED DISEASES

Almost all generalized or systemic diseases have abdominal repercussions of course Some of these are discussed in succeeding chapters In addition there are three special abdominal variants of diseases which are primarily nonabdominal that should be considered in a category by themselves because they manifest themselves solely through abdominal symptoms—largely pain—and are constantly raising problems in differential diagnosis These are the abdominal variants of epilepsy migraine and angina They are difficult clinical concepts the validity of which is almost unprovable during life and entirely so after death For this reason opinions over their clinical usefulness are likely to be adamant as well as variable which is part of the fun of gastroenterology

ABDOMINAL EPILEPSY

There is a large group of gastroenterologists who believe thoroughly in the concept of an abdominal epileptic equivalent (Moore's disease) but the majority of neurologists remain skeptical The several complex abnormal associations between brain and gastrointestinal tract manifest themselves clinically for the most part as functional diseases discordant muscular activities probably the mucosal diseases of neurovascular dysfunction and direct Cushing effects But there is reason too to believe that abdominal epilepsy is an anatomic and physiologic possibility Observations made during craniotomy have shown that disagreeable abdominal sensations may result from cortical stimulation Just posterior to the postcentral convolution there is an area which upon stimulation at times gives rise to abdominal cramps in epileptics Diencephalic lesions either spontaneous or experimentally produced may have a profound effect upon gastrointestinal motility Visceral aurae are common in classical grand mal epilepsy and visceral phenomena are present during most grand mal attacks In petit mal the patient is particularly aware of visceral sensations

Clinically abdominal epilepsy is understood to mean painful paroxysmal attacks of discordant gastrointestinal hypermotility secondary to abnormal discharges from the diencephalon or perhaps the postmotor and premotor cortex The episodes are sudden brief and stereotyped There occasionally may be small motor movements and rarely short episodes of respiratory arrest The clinical picture is such that a large proportion of the patients give a history of one or more fruitless abdominal exploratory operations

The cerebral mechanisms are presumably no different from those responsible for the more classical forms of epilepsy In about half of the cases in certain reported series there has been a history of brain trauma and this has been thought to be the cause There must be electroencephalographic evidence of cerebral dysrhythmia before the diagnosis can be entertained This is the only concrete finding and it of course is not specific for abdominal epilepsy If there are suggestive encephalographic changes the diagnosis may be made from the clinical impression provided

other causes of periodic abdominal pain can be satisfactorily excluded Unfortunately the anticonvulsant drugs which are certainly the treatment of choice do not necessarily permit one to judge the accuracy of the diagnosis because they do not always help

ABDOMINAL MIGRAINE

Many clinicians question whether it is useful *to split an abdominal equivalent of migraine* from the classical form Classical migraine shows differing patterns from patient to patient however constant the recurring attacks may be in each Nausea and vomiting are common and at times there may be considerable abdominal discomfort Because the symptoms of the migraine patient sometimes cause him to seek advice first from the gastroenterologist however it is difficult not to maintain interest in the possibility of a valid abdominal equivalent The feature which suggests the condition is periodic attacks of severe abdominal pain with normal interims in a person who has a personal or family history *of classical migraine* The attacks are similar to those of the common form of the disease except that abdominal pain occurs instead of or is more severe than headache In some patients who have the classical symptoms of migraine there is a gradual change in the manifestations until periodic abdominalgia predominates A common physical finding is the scar of a previous futile operation Antimigraine drugs particularly the widely used ergotamine tartrate caffeine combination furnish symptomatic help if taken very early in an attack

ABDOMINAL ANGINA

Abdominal angina refers simply to abdominal pain which is secondary to visceral arterial insufficiency It is difficult to diagnose and in fact difficult even to think about Anyone who has been a small boy remembers the pain in the side which regularly was experienced when he went out and ran immediately after lunch This phenomenon can perhaps be explained by splenic ischemia which is secondary to gastrointestinal plethora induced by the intestinal phase of digestion Old people who at autopsy are found to have advanced sclerotic disease of the major visceral arteries without evident visceral disease are frequently those who complained during their last years of another familiar syndrome painful fullness after small meals with nausea and sometimes an apparent fear of eating People with severe aortic sclerosis frequently experience *mild epigastric pain with diffuse upper abdominal* radiation when walking and find relief by sitting down These are some of the common pain syndromes which lead one to think that under certain conditions of ischemia some of the abdominal organs may signal distress through pain The difficulties inherent in trying to prove the point are evident

If there is a true syndrome of abdominal angina due to arterial incompetence during periods of physiologic visceral stress perhaps the following infrequent but recognizable syndrome can be ascribed to it There are transient attacks of abdominal pain coming on at the completion of a meal usually the *large meal of the day The pain begins in the* epigastrium but quickly radiates to both subcostal areas and to the lumbar region It is severe and often frightens the patient He regularly lies down as soon as the spell begins or he may collapse briefly The attacks last about 20 minutes Between spells the patient has no abdominal complaints

ABDOMINAL AORTIC ANEURYSMS

Fifty years ago it was said that only about 10 per cent of aortic aneurysms occur in the abdominal segment but during the past decade the proportion has increased rapidly The absolute incidence is increasing too and one result has been greater didactic emphasis on the well known observation that abdominal aortic aneurysms are important for many more reasons than the circulatory problems which they may create From the gastroenterologist s point of view their main subjective feature is an aggravating type of abdominal pain The location and quality of the pain are most variable Frequent sites of referral are the low back epigastrium hypogastrium

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Many clinicians question whether it is useful to split an abdominal equivalent of migraine from the classical form Classical migraine shows differing patterns from patient to patient however constant the recurring attacks may be in each Nausea and vomiting are common and at times there may be considerable abdominal discomfort Because the symptoms of the migraine patient sometimes cause him to seek advice first from the gastroenterologist however it is difficult not to maintain interest in the possibility of a valid abdominal equivalent The feature which suggests the condition is periodic attacks of severe abdominal pain with normal interims in a person who has a personal or family history of classical migraine The attacks are similar to those of the common form of the disease except that abdominal pain occurs instead of or is more severe than headache In some patients who have the classical symptoms of migraine there is a gradual change in the manifestations until periodic abdominalgia predominates A common physical finding is the scar of a previous futile operation Antimigraine drugs particularly the widely used ergotamine tartrate-caffeine combination furnish symptomatic help if taken very early in an attack

ABDOMINAL ANGINA

Abdominal angina refers simply to abdominal pain which is secondary to visceral arterial insufficiency It is difficult to diagnose and in fact difficult even to think about Anyone who has been a small boy remembers the pain in the side which regularly was experienced when he went out and ran immediately after lunch This phenomenon can perhaps be explained by splenic ischemia which is secondary to gastrointestinal plethora induced by the intestinal phase of digestion Old people who at autopsy are found to have advanced sclerotic disease of the major visceral arteries without evident visceral disease are frequently those who complained during their last years of another familiar syndrome painful fullness after small meals with nausea and sometimes an apparent fear of eating People with severe aortic sclerosis frequently experience mild epigastric pain with diffuse upper abdominal radiation when walking and find relief by sitting down These are some of the common pain syndromes which lead one to think that under certain conditions of ischemia some of the abdominal organs may signal distress through pain The difficulties inherent in trying to prove the point are evident

If there is a true syndrome of abdominal angina due to arterial incompetence during periods of physiologic visceral stress perhaps the following infrequent but recognizable syndrome can be ascribed to it There are transient attacks of abdominal pain coming on at the completion of a meal usually the large meal of the day The pain begins in the epigastrium but quickly radiates to both subcostal areas and to the lumbar region It is severe and often frightens the patient He regularly lies down as soon as the spell begins or he may collapse briefly The attacks last about 20 minutes Between spells the patient has no abdominal complaints

ABDOMINAL AORTIC ANEURYSMS

Fifty years ago it was said that only about 10 per cent of aortic aneurysms occur in the abdominal segment but during the past decade the proportion has increased rapidly The absolute incidence is increasing too and one result has been greater didactic emphasis on the well known observation that abdominal aortic aneurysms are important for many more reasons than the circulatory problems which they may create From the gastroenterologist s point of view their main subjective feature is an aggravating type of abdominal pain The location and quality of the pain are most variable Frequent sites of referral are the low back epigastrium hypogastrium

ease itself is self limited and usually resolves after about three days If the patient is operated upon the symptoms of lymphadenitis ordinarily will have disappeared by the time the immediate postoperative period has passed

adenitis sometimes seems to be responsible for minor easily overlooked illness in country children characterized by colicky mid abdominal pains vomiting alternating diarrhea and constipation sweats and poor weight gain It may persist for months eventually

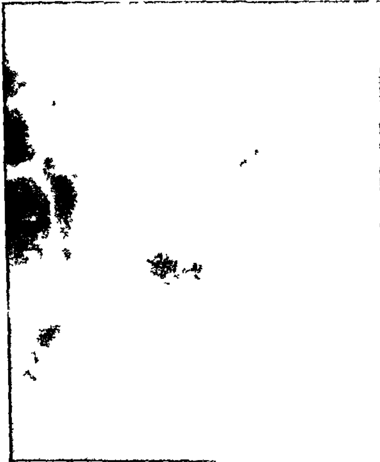


Fig 40 Chance roentgen finding of unsuspected old tuberculous mesenteric lymphadenitis The configuration of the calcified shadows is characteristic

CHRONIC MESENTERIC LYMPHADENITIS

Whenever chronic enteritis exists the regional mesenteric nodes are likely to take part in the process It is unusual for accompanying chronic lymphadenitis to become of clinical importance except when tuberculosis is at work Then there is the threat that caseous nodes may rupture leading in some cases to tuberculous peritonitis (Ball s disease) Uncomplicated tuberculous mesenteric

being overcome by natural processes Usually tuberculous nodes resolve with calcification and their presence remains unrecognized unless the abdomen is examined radiologically The Lubeck catastrophe proved that calcification begins within 18 months of infection and may be fully developed in three years Large doses of calciferol speed the process but there is some question of whether it is wise to interfere

mass is found Treatment consists of surgical release of the herniated mass with whatever local repair seems necessary to prevent recurrence

ACUTE MESENTERIC LYMPHADENITIS

This is a common benign condition which is important largely because its clinical manifestations simulate those of acute appendicitis Remarkably little is known about it considering the frequency of the diagnostic problem it creates It seems basically to be a simple inflammatory process of the mesenteric lymph nodes commonly those of the ileocecal region At the moment specific etiology is not known The nodes become enlarged and grossly inflamed but remain soft (Fig 39) Only acute nonspecific inflammatory reaction can be found *histopathologically* *Staphylococci* or streptococci can sometimes be obtained by culture from the peritoneum which is likely to contain more than the usual amount of free fluid These organisms can often be isolated from the patient s throat as well It is probable that bacterial origin will eventually be proved

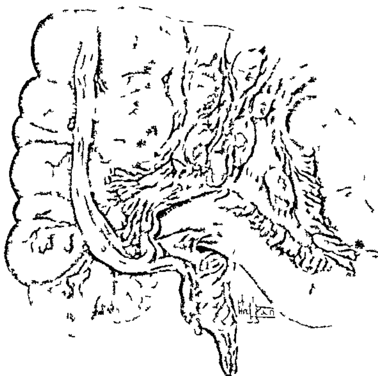


FIG 39 Operative findings in case of acute mesenteric lymphadenitis

The patient is usually a child or young person and often he gives the history of a recent upper respiratory infection He tells a story which is quite indistinguishable from that of acute appendicitis except that there may have been a series of similar spells in the past The physical signs are those of acute inflammation in the ileocecal area with local peritoneal involvement There is fever and leukocytosis

Diagnosis can often be suspected on clinical grounds but it cannot be confirmed without surgical exploration The patient frequently presents the manifestations which demand exploration of the appendix and discovery of ileocecal mesenteric lymphadenitis instead of acute appendicitis carries no implication of poor surgical judgment Under these circumstances it is safe and proper to remove the normal appendix The dis

important to distinguish it from an enteric reduplication cyst, because removal of the latter necessitates special technical handling if damage to the arterial supply of the normal bowel beyond is to be avoided An enteric *reduplication cyst is attached intimately to* the wall of the bowel which it contacts and its own wall is much thicker than that of a mesenteric cyst Pathologically mesenteric cysts may be classed as

1 Simple from embryonic remnants or lymphatic obstruction subdivided according to the cyst contents as serous chylous and sanguinous

2 Multiple cystic disease of serous or chylous nature accompanied by edema and fibrosis of the intervening mesentery

3 Echinococcic

4 Inflammatory

5 Tuberculous

6 Neoplastic dermoids lymphangiomas hemangiomas teratomas

Although similar in some ways to cysts which develop out in the mesentery *retro peritoneal cysts* have quite a different clinical significance Here obstruction of the inferior vena cava is the important complication while complications depending on mobility are of course absent Because the most important type is the Wolffian cyst retro peritoneal cysts are three times as common in females as in males Posttraumatic hema toma cysts are next most frequently en countered Other types which have been reported are simple chylous cysts dermoids inflammatory cysts and the cysts of echi nococcosis There are no characteristic symp toms no regular site of development and no usual age period for symptoms to appear Detection of a *retroperitoneal cyst which is* large enough to cause trouble is usually pos *sible by abdominal palpation for they tend* to be tense and firm Percussion of the posterior abdomen with the patient lying prone sometimes reveals widening of the normal area of central flatness

Solid tumors of the omentum and mesen teries are very rare if primary and metastatic lesions of the mesenteric lymph nodes are excluded Perhaps it can be said that tiny lipomas are not rare but these are of no clinical consequence Primary sarcomas are *occasionally reported* as are fibromas Often such tumors lie close to the free edge of the mesentery and come in contact with the intestine so that the actual tissue of origin is difficult to determine

MEDICAL PERITONITIS

BENIGN PAROXYSMAL PERITONITIS

Benign paroxysmal peritonitis is one of the periodic diseases of Reimann and one which is characterized by a striking ethnic susceptibility—Arabs Armenians Jews and less commonly the more western Mediter ranean groups The periodic diseases com prise a group of disorders which regularly recur sometimes over a period of many years and which although they may cause severe disability for several days at a time leave the general health unimpaired Falling within this category are periodic fever periodic neutropenia periodic arthralgia periodic paralysis certain types of angioneurotic edema allergic purpura and the disease under consideration here Although an allergic or infectious basis is strongly suggested in some instances of benign paroxysmal perito nitis a natural rhythm or cycle by itself seems to be part of the explanation for the phenomenon

The disease must be suspected in every patient of eastern Mediterranean extraction who complains of recurring spells of severe abdominal pain without apparent sympto matic residuals or pathologic sequels Char acteristically the spells last from a few hours *to about three days The manifestations* are steady generalized pain fever leukocytosis abdominal tenderness and some degree of spasm of the abdominal wall muscles Occa sionally pain with a pleuritic quality is the dominant symptom The clinical picture may be frightening to both patient and doctor and may simulate closely an acute surgical emer gency Unless the patient s history of previ ous attacks is carefully evaluated laparotomy

may well be decided upon Nothing can be accomplished thereby A large proportion of patients have already been explored during an early attack If the abdomen should be opened and the peritoneum biopsied a mild sterile nonsuppurative peritonitis would be found The picture often simulates Henoch s purpura too and one notes in the literature considerable confusion between the two diseases

The attack subsides spontaneously and completely As the patient usually has already discovered similar attacks can be expected to recur at regular or irregular intervals over many years If he has made note of the dates of previous attacks he may find a chronologic pattern which will permit accurate prediction of future trouble He may be able to arrange his schedule to fit his disease

No satisfactory means has been found to prevent or to end an attack Although this is an uncommon disease published reports show that a great many therapeutic agents have been used without encouraging results Bed rest and simple analgesia are in order until spontaneous remission

TUBERCULOUS PERITONITIS

Even though tuberculosis continues to flourish throughout this country and the world pasteurization can be thanked for rendering the enteric and peritoneal forms rather obsolescent Most cases of tuberculous peritonitis are believed to originate either by direct extension from the bowel or by rupture of a tuberculous mesenteric node which has been secondarily infected from the bowel The bovine strain of tubercle bacillus therefore is ordinarily involved Some instances however are unquestionably of hematogenous origin and others arise as a result of extension from the fallopian tube so one assumes that tuberculous peritonitis will not become entirely obsolete for a long time

Tuberculous peritonitis is encountered mostly in children and young people The symptomatology is usually vague at the beginning of the clinical course Even when the patient becomes sick quickly the manifestations are systemic rather than peritoneal The usual symptoms of tuberculosis are prominent—fever malaise and weight loss Abdominal complaints seem merely to be those of any systemic infection—anorexia excess gas bothersome cramps and constipation or diarrhea As the course continues the patient becomes increasingly aware that the trouble is in his abdomen

When the abdomen is examined the findings in a portion of cases are so unique and striking that the specific diagnosis can be suspected with some assurance at the bedside These findings can be expected only in the plastic form of tuberculous peritonitis where the pathologic process is characterized by a tenacious fibrous peritoneal reaction This results in matting together of the bowel shortening of the small bowel mesentery and loculation of many small pockets of fluid here and there between bowel loops To the palpating hand the process presents a consistency which is unmistakably doughy This sensation is a very real one and once encountered it can never be forgotten A term more descriptive than doughy could not be used There is also a fullness to the abdomen which looks symmetrical but which upon palpation is found to be caused by a combination of easily identified gas distended loops of small bowel and firmer masses which presumably represent encapsulated exudate In addition to the unique consistency of the deep structures there is a peculiar loss of tone within the abdominal wall muscles themselves although little sagging is evident when the patient stands

The exudative form of tuberculous peritonitis is about as common as the plastic form and here the main abdominal finding is simply ascites Physical examination furnishes no special hint regarding tuberculous etiology

Roentgen examination of the small intestine gives suggestive diagnostic information after the peritoneal process has been active for some time The signs are more striking in the plastic than the exudative

important to distinguish it from an enteric reduplication cyst because removal of the latter necessitates special technical handling if damage to the arterial supply of the normal bowel beyond is to be avoided An enteric reduplication cyst is attached intimately to the wall of the bowel which it contacts and its own wall is much thicker than that of a mesenteric cyst Pathologically mesenteric cysts may be classed as

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patient is often very precise The pain is where the disease is and the central zone of the abdomen has no better chance than the rest of the abdomen Thus when a lesion which has caused splanchnic pain extends to involve an area innervated by somatic nerves diffuse pain centered somewhere along the midline usually moves laterally to become localized over the lesion But differentiation is a little more complicated than this for not often does visceral pain cease *when somatic pain begins Further* more nausea vomiting sweating and panic are common accompaniments of severe parietal peritoneal irritation in this case being part of the systemic reaction to the local disease

INTERPRETATION

Differential interpretation of the pains of the well known potentially catastrophic gastrointestinal diseases are difficult enough but unfortunately nonsurgical diseases diseases of other organs and certain systemic diseases can produce the same clinical picture Surgical exploration of the abdomen in many of these can be disastrous This is a danger which must occupy the thinking of those who practice most any of the specialties particularly general surgery internal medicine urology *gynecology* and infectious diseases There are no useful rules or formulas to apply here and accurate diagnosis depends partly on one s experience with these other diseases partly on one s facility in re*membering them when acute abdominal pain* presents itself A listing of the important nongastrointestinal nonsurgical diseases and processes which must be remembered could extend indefinitely normal ovulation (mittelschmerz) *pneumonia spontaneous pneu*mothorax diaphragmatic pleurisy acute infectious diseases of many varieties rheumatic fever falciparum malaria myocardial infarction acute congestive heart failure acute pericarditis *dissecting aortic aneurysm* diabetic acidosis uremia Addison s disease porphyria Henoch s purpura sicklemia serum sickness the heavy metal poisonings criminal poisonings tabes dorsalis herpes zoster of the skin and of the peritoneum, intercostal neuralgia arachnidism trichinosis the thoracic and lumbar spinal arthritides and certain infectious and obstructive diseases of the upper urinary tract

It is important to look outside the peritoneum and especially above the diaphragm whenever acute abdominal pain is encountered Acute pleural and pericardial diseases frequently mimic perforated ulcer and other *abdominal emergencies exactly There may* be abdominal rigidity and even the segmental zone of chest or abdominal skin pallor which heralds an acute surgical abdomen (Wernoe s sign) The important thing is to realize that this sort of mimicking clinical phenomenon can occur so that it is included routinely in one s thinking when considering the patient with acute abdominal pain

The help to be expected from objective examination methods will be mentioned as the discussion progresses A wide variety of routine and special roentgenologic and laboratory studies are applicable to the emergency investigation of the various acute abdominal diseases Among the quickly available routine examinations none is quite as helpful for general screening purposes as is the plain x ray film of the abdomen Sometimes it gives almost pathognomonic information as when it simply shows the distended atonic bladder which signals arachnidism At other times it may reveal signs which prove the need for immediate surgical *intervention* or for further special studies

ACUTE BACTERIAL PERITONITIS

Acute bacterial peritonitis has been regarded as a catastrophic disease since the *beginning of recorded* medical history and one might wish that certain improvements in therapeutic technology had not led to quite so much of a decline in professional fear of the disease This remains a potentially deadly process which demands continued serious concern

Acute bacterial inflammation of part or all of the peritoneal surfaces may follow

penetrating abdominal wounds contamination at operation and escape of bacteria from one of the intraperitoneal organs The last process may be spontaneous as part of the natural history of a great number of diseases or it may follow instrumentation such as that of criminal abortion sigmoidoscopy and peritoneoscopic biopsy The diseases commonly responsible for acute peritonitis are well known appendicitis duodenal and gastric ulcer acute cholecystitis diverticulitis coli acute salpingitis gangrene of the bowel and necrotic tumors of many types The peritonitis of acute pancreatitis has unique characteristics and will be discussed elsewhere

It can always be assumed that the specific bacterial flora which will be found in any of the varieties of acute peritonitis is at the outset the same as that of the organ or disease process from which the infection is released into the peritoneal cavity but that some organisms will then do better in this new site than others Most often the bacteria originate from the intestinal contents and initially members of the colon groups and several types of anaerobes predominate Depending on the amount of peritoneal reaction which has preceded bacterial contamination on the rapidity and quantitative severity of initial contamination and on the effectiveness of the patient s natural protective devices infection may quickly spread over all peritoneal surfaces or it may be walled off as an abscess The localizing efforts of the omentum and the efficiency of peritoneal response in producing adhesions seem particularly important in this process

The more experienced a clinician is the more likely he is to admit that in spite of certain published descriptions the early diagnosis of acute peritonitis is not as easy as it is supposed to be As in any clinical situation the diagnosis would not be difficult if one could follow the whole course of events from start to finish but this is not often possible If the patient is to receive optimum therapy the diagnosis must be an early one Too often in clinical teaching the subject is presented as though one is merely expected to predict the findings at the time of autopsy

The main diagnostic problem in many cases is recognition of the addition of peritonitis to the picture already produced by the underlying disease Another problem is created by failure to recognize that much acute peritonitis quickly becomes contained by the peritoneal defenses The manifestations which help diagnosis most are pain tenderness and spasm In most cases of acute peritonitis due to organ perforation it is obvious that even though the problem is shortly to be that of bacterial infection the first pain is due to chemical peritonitis therefore the early signs will not be those of infection The pain is sudden and very severe in some cases Pain of this nature which is sufficient to produce syncope in the male is usually due to the sudden peritoneal irritation of perforated ulcer If perforation is slow and confined by peritoneal reaction stimulated by gradual mural penetration there may be no change in the intensity of the pain but instead a shift from visceral to somatic quality Here the signs of inflammation occur early The pain of peritonitis of any type is always of course of somatic origin with its helpful localizing feature and aggravation by movement but early there may also be the splanchnic pain of spasm before bowel paralysis supervenes Thus abdominal auscultation very early shows that the bowel is hyperactive but as peritonitis becomes generalized it becomes paralyzed

There is always tenderness and this is usually localized at the area of irritation It is common experience however to note that successive examiners find the point of maximum tenderness to lie in quite different abdominal regions of a patient with early peritonitis In cases of acute bowel perforation and other overwhelming processes tenderness is likely to be most prominent early in the course As the peritonitis becomes generalized and the patient s sensibilities are obtunded by systemic intoxication

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Acute bacterial inflammation of part or all of the peritoneal surfaces may follow

between liver and diaphragm which were secondary to long extinct gonococcal salpingitis

Perhaps the most significant feature of adhesion formation is the remarkable variability from person to person in the tendency of peritoneal surfaces to become stuck together during defensive and reparative processes In the lower mammals distinct species differences are found and these act in a predictable fashion Among humans however there are some individuals who at autopsy show not an adhesion after a life marked by a few documented periods of acute peritonitis several abdominal operations and perhaps the sojourn of a peritoneal drain for a couple of weeks On the other hand other people who have had only some slight peritoneal insult must spend much of their lives thereafter trapped in an endless series of intestinal obstructions and emergency operations Fortunately the adhesion problem is not a common one but unfortunately the adhesion explanation proves to be a convenient diagnostic dodge

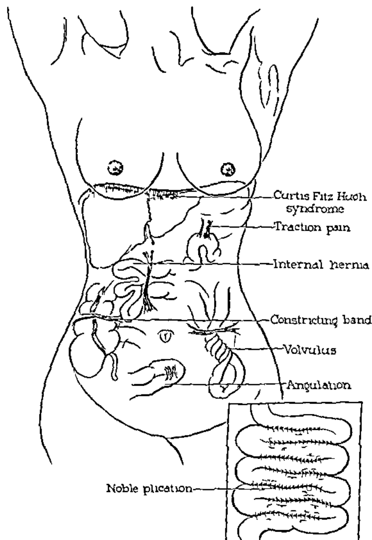


FIG 43 The main types of peritoneal adhesion and their complications

There is no question that intra abdominal adhesions can cause pain One can diagnose adhesion pain with a clear conscience if

he maintains a rigid concept of the quality of the sensation This is a simple mechanical pain and it depends on peritoneal traction for its stimulus Adhesions cause no pain unless they pull on something Then the patient feels a deep ache and with it often a little nausea The ache is constant is usually rather well localized and does not radiate to the back This is somatic pain so the chances are that it will not be localized in the midline When the pull stops the pain ceases Aggravation results from mechanical stretching as by twisting of the trunk extension of the spine jarring of the body and sagging of the abdominal wall Relief is obtained by flexion of the trunk lying down improving support of the abdominal wall and sometimes by pressing against the area of pain

The complications are mechanical too and as a cause of serious surgical emergencies they are very much more important than the underlying disease Intestinal obstruction either acute or chronic is the common problem Strap like bands may form in such a way across a segment of bowel that with their natural gradual contraction they slowly constrict it The obstruction which eventually develops may behave acutely An adhesive band may create a foramen through which an internal hernia may form or cause acute angulation of the bowel On occasion an adhesion forms in such a way that volvulus of the small intestine results

Treatment of complications calls for surgical release of the responsible adhesion resection of bowel that may have become gangrenous and efforts to cover raw areas with peritoneum if that be possible The problem of treating uncomplicated traction pain is much more difficult Rarely does further operative manipulation prove to be the answer in keeping with the hoary dictum that release of one adhesion makes two adhesions Not many experienced clinicians can claim however that they have never recommended surgical lysis of adhesions for the relief of disabling pain Probably the best way to give symptomatic help is to increase abdominal wall tone through calisthenics Sometimes exercises are painful for the patient and sometimes he is too old to benefit from this effort Then corsetting may provide a satisfactory answer

For the difficult problem presented by the facile adhesion former particularly when there has been repeated acute intestinal obstruction the Noble plication operation may sometimes be useful The principle of this operation is conversion of uncontrolled or chance adhesions into controlled adhesions which will not interfere with normal intestinal transit A portion or most of the small intestine is folded back and forth on itself like a carpenter s ruler and the adjacent segments sutured to each other (Fig 43) There are several technical problems involved including freeing of the intestine to make the plication without injuring it and preventing obstructive angulation at the bends

CALCIFICATION AND OLEOGRANULOMA OF THE PERITONEUM

Very rarely peritoneal calcification is discovered roentgenologically as an isolated finding in apparently normal neonates In such cases there is spontaneous resorption of calcium within a year A rare syndrome of the newborn consists of simple pancreatic fibrosis and peritoneal calcification with intervention of death within a few weeks or months of birth due to intestinal obstruction perforation and peritonitis Similar is the syndrome of peritoneal calcification following spontaneous bowel perforation in neonates with mucoviscidosis but here the peritoneal calcification is secondary to meconium peritonitis Rarely tuberculous peritonitis heals to leave residual plaques of calcium scattered through the peritoneum It has been reported that peritoneal calcification can sometimes be demonstrated within 24 hours of the onset of acute bacterial peritonitis

Still to be found now and then are cases of peritoneal calcification secondary to in

between liver and diaphragm which were secondary to long extinct gonococcal salpingitis

Perhaps the most significant feature of adhesion formation is the remarkable variability from person to person in the tendency acute peritonitis several abdominal operations and perhaps the sojourn of a peritoneal drain for a couple of weeks On the other hand other people who have had only some slight peritoneal insult must spend much of their lives thereafter trapped in an endless

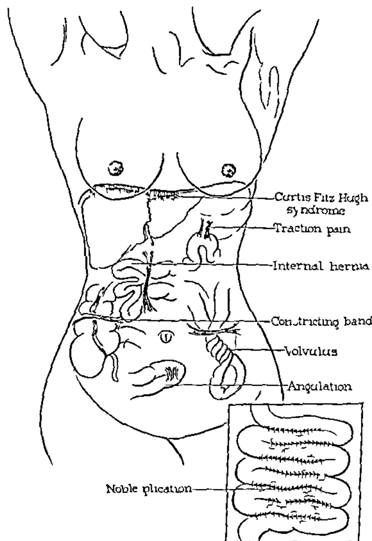


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There is no question that intra abdominal adhesions can cause pain One can diagnose adhesion pain with a clear conscience if

be consulted by the patient with kidney stones unsuspected pregnancy diffuse collagen disease endocrine disorder and many other far removed processes which are accompanied by dyspepsia

It is apparent then that the patient's history and certain of his physical manifestations are of more help in measuring his response to his lesion than in identifying his lesion Not so very long ago it was taught that the history alone should permit one to make a precise diagnosis in cases of gastric disease For example it was said that the chronologic details of the patient's symptoms furnish sufficient information to distinguish between gastric and duodenal ulcer and even to localize the lesion's position on the organ's circumference This was an attempt to make a science out of misappropriated data It worked all right and could be employed with confidence as long as the results were not checked by objective examination technics When roentgenologic study became routine for most patients with stomach complaints it was found that not many correct diagnoses were being made Now it can be freely admitted that whatever the symptomatic picture seems to show gastric diseases are among the most difficult in medicine to diagnose on historical grounds alone This is no repudiation of the importance of studying the patient through his history Instead it is the warning that as far as stomach complaints are concerned one hears from the patient not so much about the disease itself but about the way his stomach is reacting to the disease that is disturbing it

Objective means of examining the stomach have many frailties too as will be discussed and not the least of these is their effectiveness in diverting attention away from the whole patient They have been used to emphasize the patient's abnormal structure rather than his problem They have been used as interpretational devices rather than as the simple aids to physical diagnosis for which they were intended

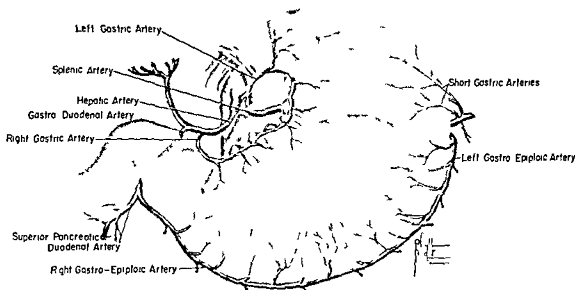


FIG 44 The arterial circulation of the stomach

The stomach is almost as accessible to objective study as is the esophagus but its configuration and motility features are so much more complex that proper translation of the results of study is a good deal more difficult This is reflected in the common observation that opinions regarding diagnosis and consequently treatment of stomach diseases are at remarkable variance from locality to locality and from gastroenterologist

to gastroenterologist It is interesting that opinions seem to be diverging more and more as time goes on possibly as a healthy reaction to authority It may be that gastrology is approaching a renaissance

OBJECTIVE METHODS OF EXAMINATION AND GENERAL DIAGNOSTIC FEATURES

STUDY OF GASTRIC SECRETION

Gastric secretory activity is a notably variable function and determination of the concentration of acid and pepsin in aspirated gastric juice gives information which is too casual to tell the clinician very much A stomach examined by serial gastric analyses gives quite different results from day to day This is particularly disconcerting in the study of achlorhydria for a certain secretory stimulant may fail to elicit free acid on one occasion but show plenty on another The cycle of acid and pepsin secretion is well known from hour to hour through the day and night in health and in some diseases but the factors which control it over longer periods are not Although secretory patterns become evident in certain diseases if the results from a great many patients are compiled for the individual patient the results of a gastric analysis tell little In reaching a diagnosis of stomach disease it is necessary to get much closer to the pathologic process than recognition of some secretory change which may have taken place In particular it is dangerous to put faith in achlorhydria as a sign of malignancy when attempting to distinguish between benign and malignant gastric ulcers tendencies toward achlorhydria in malignancy and away from achlorhydria in benignancy are only relative Again it is necessary to get much closer to the lesion For clinical purposes gastric analysis is of the most use in studying the patient suspected of pernicious anemia For certain research purposes it is used a great deal

If gastric analysis is to be done anyway it is important to bear these points in mind Aspiration of gastric contents is an unreliable sampling technic Fluid in the stomach is far from homogeneous Different portions are reached by the aspirating tube in a chance fashion The amount that can be aspirated bears no relationship to the amount produced The gastric mucosa shows variable response to a secretory stimulant from time to time The presence of a tube in the stomach tends to depress gastric secretion for about half an hour after its passage

The actual technic of gastric analysis is well known and details need not be given Continuous intragastric recording of the pH is a better method for obtaining the desired information but the apparatus necessary is available only in research laboratories The usual method is to remove a fasting specimen administer a stimulant and then remove specimens at half hour intervals for about two and one half hours The two best stimulants are coffee and subcutaneous histamine Large doses are required in either case for optimum stimulation Sometimes when no free acid can be elicited upon histamine stimulation a continuous overnight aspirate contains a good concentration in spite of the fact that in people without ulcer the stomach ordinarily rests at night

This form of gastric analysis invokes the humoral mechanism of gastric secretion Vagus mediated stimulation is the other main mechanism which governs gastric secretion It probably plays no part in the results of ordinary gastric analysis In some people the first mechanism appears largely responsible for physiologic secretory activities and in others the second mechanism The Hollander test is designed for investigating the influence that vagus stimulation is exerting on the secretory response It is based on the principle that secretory activity of the vagus nerves is adequately stimulated by hypoglycemia Its main clinical use is for testing completeness of surgical vagotomy To carry out the Hollander test a resting gastric aspirate is obtained hypoglycemia is induced with intravenous insulin and aspirations are continued at half hour intervals for about three hours Meanwhile venous blood samples are drawn at the

scopy and gastroscopy into one examination increases, the small flexible gastroscope which can be passed through the esophagoscope promises to become popular

Prior to passage of the instrument the gastroscopist must determine that there are no obstructions or dangerous lesions in the pharynx or esophagus, and he should make available to himself whatever information roentgenology examination is able to give He must, therefore either have made a recent fluoroscopic study of the esophagus and

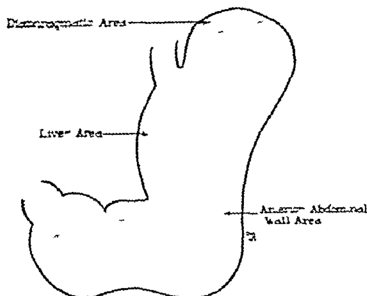


Fig 48 Configuration of the inflated stomach as it exists during gastroscopy composed as a compilation of tracings of x ray films taken of 20 patients during the procedure The relationships of the anterior wall are shown

stomach himself or have examined films taken at such an examination An exception is made for emergency gastroscopy during hemorrhage to be discussed in the chapter on hemorrhage The contraindications to gastroscopy are relative ones governed by the urgency of obtaining certain anticipated information Thus mild pharyngitis is ordinarily reason to postpone a routine examination but it is permissible to gastroscope a patient with *pneumonia if penetrating gastric ulcer is suspected* It is not good to lay down a set of definite indications and contraindications because individualized clinical judgment must prevail but it may be said that gastroscopy is *not often performed when there is severe* kyphosis, pharyngeal or esophageal diverticulum, esophageal stenosis, esophageal angulation acute infectious disease aortic aneurysm recent myocardial infarction or manic psychosis.

Gastroscopy is an outpatient procedure Although the examination only requires five or ten minutes sedation makes it necessary for the patient to remain under observation for a total of about four hours The patient is prepared merely by fasting a moderate dose of barbiturate by mouth atropine subcutaneously and a gargle of Pontocaine with Adrenalin Many other pharmacologic preparations are suitable but a barbiturate is important as prophylaxis against reactions to local anesthetics At their second examination some patients request that the medication and anesthetic be omitted and in a certain type of patient none seems desirable The *patient is ordinarily examined in the left* lateral position but some lesions are more easily seen if he is rolled onto his back or right side or if he is examined in the sitting

troscopy it is well to take advantage of the *help it occasionally gives*

GASTROSCOPY

Gastroscopy supplements roentgenography in such a way that between the two methods most organic forms of gastric disease can be diagnosed with some degree of assurance These are ideal partners for the virtues that one lacks are found in the other Roentgenologic examination gives maximum information regarding altered motility features of temic diseases and there is risk of injury to the patient But information gained by gastroscopic examination is extremely valuable and every patient suspected of organic stomach disease whether or not x ray examination has demonstrated any should be considered a candidate for the procedure This is not a technic to be called upon only if other methods fail one of its most important functions is to act as a stabilizing influence over interpretation of roentgenologic findings

The standard gastroscope is rigid in its

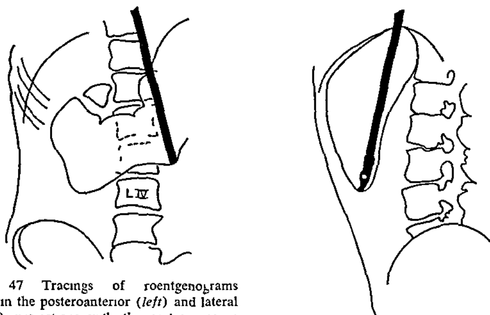


FIG 47 Tracings of roentgenograms taken in the posteroanterior (*left*) and lateral (*right*) projections with the gastroscope in place showing the relationship of the instrument to the inflated stomach The patient is in the left lateral position

the stomach and regarding localization of discrete lesions and it helps in elucidation of a lesion s negative profile Gastroscopic examination permits scrutiny of the inner wall of the stomach from different angles so that the configuration and colors of a lesion can be directly inspected Gastroscopy has several drawbacks there is variable discomfort to the patient some examinations are not successful because the instrument cannot be passed or the stomach cannot be properly inflated not all portions of the stomach can be visualized there are contraindications in the form of certain cervical thoracic and sys

upper portion and flexible in its lower Its length is such that in most patients about six inches are protruding from the mouth when the lowermost portions of the stomach are being examined Its interior is filled with short focal length lenses the wiring for the lamp at its end and an air channel for insufflation of the organ The features of the marvelous optical system include universal focus true image and a distortion free field during partial flexion of the lower part The objective prism is set so that the view is at right angles to the axis of the instrument To increase the area of the field at each position of the instrument one instrument is equipped with a solenoid controlled tilting mirror at the objective and another has pull wire control over the flexible tip As the tendency to combine esophago-

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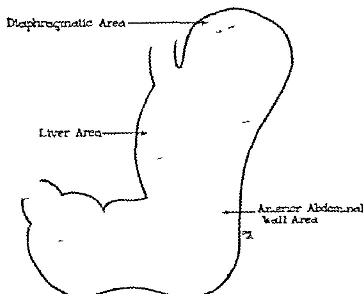


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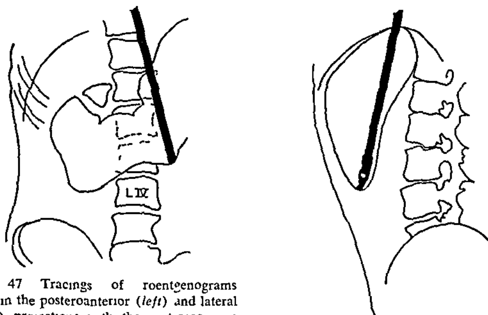


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The electrogastrograph is a complicated electronic machine but the technic of using it is not Two leads with identical electrodes are used The reference lead is conveniently fastened to the skin at the right deltopectoral groove The gastric lead is swallowed its different positions in the stomach during recording being determined fluoroscopically

CONFIGURATION AND MOBILITY

Many shapes and positions are normal for the stomach They are governed by its intrinsic motility volume of its contents torso configuration extrinsic influences of nearby organs and gravity Because these vary with the conditions of examination the gross anatomy of the stomach appears quite different to the roentgenologist gastroscopist surgeon and pathologist Although the empty stomach is encompassed by oppressive organs a condition which is so striking to one who opens the abdomen at autopsy the filling stomach easily finds accommodation for itself The configurational variations which may result are normal without clinical or pathologic significance In ptosis half of the filled stomach may lie in the pelvis when the person is erect and it may even extend down into an inguinal hernia In such cases nevertheless the stomach joins the duodenum only a vertebra or a little more below the normal position This is the extreme of the *fish hook stomach* The opposite extreme is the transverse or *steer horn stomach* which when empty remains close to the undersurface of the liver and when full does not depart far from it This type is encountered almost exclusively in the obese big chested person with a broad subcostal angle *Cascade stomach* a radiologic concept is one in which the fundus retains a puddle of barium suspension after most of a barium meal has passed by gravity into the dependent part of the stomach It is due to the fundus being deflected posteriorly to such an extent that a little platform is created As barium is swallowed it runs into the fundus sac and when this is partially filled it spills over and down into the distal stomach

The mere weight of barium suspension has considerable effect on the configuration of the stomach during roentgenologic examination Because the fundus lies posteriorly and the lower portion is in contact with the anterior abdominal wall the barium runs into the fundus when the person is supine and towards the antrum when he is prone When the stomach is inflated at gastroscopy the conditions are quite different With the patient in the left lateral position the inflated stomach floats upward along the undersurface of the liver and its configuration is controlled largely by pressures of nearby structures (Fig 47) Barium suspension serves as a proper stimulus for gastric peristalsis Air is not as effective and after inflating the antrum the gastroscopist often must wait several minutes for peristalsis to commence He is able to observe peristalsis only in the antrum In normal stomachs almost all waves which begin high in the pars media continue without interruption to the pylorus Persistalsis cannot pass through portions of the gastric wall which are infiltrated as by tumor syphilis or tuberculosis and discovery of a motionless area indicates intramural disease This is an important sign for the radiologist and in the antrum of the stomach for the gastroscopist

GASTRIC RUGAE

The width and height of gastric rugae are governed largely by physiologic activity of the stomach s muscularis mucosae Periodically rugae are passively effaced as the stomach becomes distended and enlarge when it empties but the reverse at times is noted upon roentgenologic examination Immediately after a stomach is resected the rugae are found to be prominent and resistant to stretching but if the specimen is not fixed they relax and disappear after a few hours Similarly at autopsy the smoothness of the mucosa correlates with the time lapse following death

The major rugae follow courses which tend to run from cardia to pylorus Those of the fundus and greater curvature of the pars media tend to be largest There are smaller

position After the instrument has been passed the stomach is inflated with air for the examination The proximal part of the lesser antral curvature medial portion of the fundus a portion of the posterior wall and part of the greater curvature cannot be visualized in most cases Gastroscopy does not permit examination beyond the gastric side of the pylorus It is a fair guess that at most examinations the gastroscopist sees less of the stomach than he thinks he does He sees most of it though and in some patients almost all of it He can study the color and texture of the mucosa antral motility rugal pattern and localized and generalized diseases which fall within his view Color and configuration are paramount to gastroscopic interpretation

GASTRIC MUCOSAL BIOPSY AND EXFOLIATIVE CYTOLOGY

It would be ideal if a large tissue specimen could be obtained easily and safely by the transoral route from every gastric lesion or suspicious area This is almost possible with the Benedict operating gastroscope which permits one to take small pieces of tissue under gastroscopic control from many areas of the pars media and fundus Although the technic has disadvantages it makes an important contribution to accurate diagnosis in some instances As with any biopsy technic only the positive result is significant

The other method for taking biopsies of the gastric mucosa is by the vacuum biopsy instrument a simple tube without external moving parts which shears off a knuckle of mucosa which has been sucked into its end The technic is very easy quick and safe and permits taking of serial specimens at will over long periods The tissue specimen it delivers measures about 5 mm in diameter and includes the muscularis mucosae This is a blind biopsy technic however and although it is useful in clinical research it has no practical diagnostic value except in certain diffuse mucosal diseases—pernicious anemia the other gastritides and hemochromatosis

Study of cells which have exfoliated from mucosal lesions has proved useful in complementing other means of diagnosing gastric cancer An unquestionably positive cytologic diagnosis of carcinoma is decisive even though other examination technics give questionable results A negative cytologic examination on the other hand is of no help The technic does not provide information accurate enough to warrant its use for routine screening purposes Again it must be admitted that here is just another aid rather than an answer to the problem of early diagnosis of cancer

Several methods of collecting material for cytologic study appear to be suitable although various investigators have become rather adamant about each one and its technical details Simple aspiration lavage with enzyme solutions scrubbing with an abrasive balloon and swabbing with a soft brush are favorite methods All are of course blind collection technics Special care is exercised in preparing the material for examination An enthusiastic cytologist is the chief prerequisite Lack of experienced technicians is the main drawback in many sections of the country

ELECTROGASTROGRAPHY

Although the physiologic basis for electrogastrography (EGG) was laid more than 20 years prior to that for electrocardiography development of EGG was delayed more than a century because of uncertainties over diffusion currents The first really reliable recordings were not published until about 1950 This is for the clinician then a new technic the usefulness of which is difficult to evaluate at the moment The value of the technic for physiologic investigation is very great the same method being applicable to study of the bowel esophagus uterus and blood vessels

The difference of potential across the stomach wall is related to the organ s secretory activity There are in addition small variations which take the form of alternating current components secondary to superimposed muscular activity These produce a frequency pattern of about three cycles per minute The rhythm is constant throughout the stomach but the amplitude shows an increasing gradient as the pylorus is approached

to be due to achlorhydria probably is not a valid entity although every once in a while one encounters a patient who seems to demon strate the phenomenon

Achlorhydria is not a condition to treat and therapeutic efforts must be directed at the cause if it can be detected It is quite im possible to make substitution for gastric secre tion and pharmacologic gestures in this direc tion probably do not assist physiology to any appreciable extent

MECHANICAL AND CONFIGURATIONAL DEFECTS

It is not surprising that an organ as plastic and mobile as the stomach is subject to a great variety of mechanical and configurational abnormalities—displacements torsions rota tions foldings distentions and others In ad dition the stomach wall is thin enough to be vulnerable to perforating and rupturing types of trauma and to be influenced by alterations in impinging structures

VOLVULUS

Rotations of the stomach on its long axis may assume various degrees of completeness In spite of the mesentery which is attached to each of its curvatures the stomach is fixed only at the cardia and by means of the duodenum and a degree of rotation is part of its normal activity There is the common roentgenologic situation in which when the person is upright the greater curvature hangs in its normal dependent position but when he is lying down it rises to the level of the lesser curvature Volvulus implies more than this Symptomatic cases ordinarily make them selves known during early or middle adult life unless there is some congenital defect at work It seems probable that a good number of cases of volvulus are never serious enough to come to clinical attention There is no sex preference Several different ways of classify ing volvulus have been suggested a simple clinical one is used here because the com plexities of the mechanical forms are not as cogent as are their manifestations

Acute volvulus produces a spectacular clinical emergency In most cases the greater curvature portion swings forward and upward causing the whole stomach to revolve on its long axis It may go no further than 180 or it may continue through 360 This pulls the colon up over the stomach by traction on the mesocolon Obstruction is produced both at the cardia and first portion of the duodenum and these two areas become fiercely edema tous The gastric sac thus isolated is dis tended rapidly by its own secretions Ordi narily the blood supply is not much affected although mural necrosis and rupture have been reported Moderate amounts of serous fluid may be released into the peritoneal cavity

There are other less common configura tional possibilities in acute volvulus There may be rotation of only the upper or the lower half of the organ on this same axis so that a twist develops across the pars media Rarely is there any associated organic disease to explain acute rotations but it is clear that a prerequisite is considerable mobility or laxity of the gastrohepatic lienal and colic ligaments

The clinical picture is that of acute high abdominal catastrophe There is sudden deep epigastric pain which is both continuous and progressive It is notably resistant to morphine analgesia Occasionally there is brief vomiting early in the course but this quickly gives way to interminable severe retching Distress is severe Distention develops and respiration becomes difficult There are no signs of peri tonitis and bowel sounds usually remain normal The distended stomach can be out lined only with difficulty by palpation Clapotage can always be demonstrated late in the course Eventually the picture of gen eral collapse supervenes

Acute volvulus is a serious surgical emer gency The diagnosis is usually suggested by the clinical picture or at least the need for laparotomy is evident Plain x ray films of the abdomen seldom add much to that which is already known A diagnostically use ful sign is inability to pass a tube beyond the cardia At operation the surgeon merely reduces the volvulus a transoral tube is passed into the stomach and decompression is

branched folds between the larger ones When the stomach is empty or nearly so a couple of prominent rugae often extend the length of the lesser curvature These gave rise in the anatomist s mind of years ago to the concept of the magenstrasse or shoot which was thought to guide ingested material from the cardia directly to the antrum Roentgenologic examination shows however that both solid boli and liquids tumble into the stomach without regard to the rugal distribution A few rugae on the posterior wall which tend to be rather persistent are directly continuous with esophageal folds and course straight downward toward the greater curvature But the rugal pattern is a changing thing rugae are not structures but physiologic formations

The pattern of the rugae is of the greatest importance to roentgenologic and gastroscopic interpretation No mucosal disease has a direct effect on general rugal size and it is particularly important to note that although at times the stomach with generalized chronic atrophic gastritis has small and sparse rugae disease is not necessarily implied by the discovery of very thick rugae This is not *hypertrophic gastritis Big rugae do not imply* hypertrophy of anything in the mucosa or beneath it Even the one disease which is regularly accompanied by hyperplasia of the muscularis mucosae chronic atrophic gastritis is likely to have small rugae Tumorous infiltration particularly by lymphomas at times produces heavy ridges in the contour of the mucosal surface but these must not be mistaken for rugae

Most useful for diagnostic purposes are local alterations in rugal pattern Ulcers and all forms of tumors cause interruptions or distortions of the nearby rugae The distortions tend to point to the lesion Rugae characteristically run to the edge of a benign ulcer crater while local infiltration tends to efface them short of tumorous craters Intramural tumors spread and thin the overlying rugae

ACHLORHYDRIA

Failure of the gastric mucosa to secrete acid is explained either by absence of parietal cells or by functional inactivity of the cells The first is due to generalized atrophic gastritis which has progressed to complete extrusion or destruction of the secretory cells and it is permanent In functional achlorhydria no free hydrochloric acid is obtainable from the stomach yet gastric mucosal biopsies reveal normal or only mildly altered mucosal histology Achlorhydria in these cases is temporary and is potentially reversible and achlorhydria is not a proper diagnosis One can only speak in such terms as achlorhydria of the moment or achlorhydria this week There is no way to make a positive distinction between the two forms of achlorhydria except by examining mucosal biopsies for functional achlorhydria may persist for weeks or months before acid secretion recommences

Functional achlorhydria can *apparently* have a great many explanations but these are not well understood Most acute infectious systemic diseases temporarily suppress secretory activity as do certain endocrinologic disturbances In some instances of chronic malnutrition achlorhydria is found even though *gastric mucosal biopsies show normal* anatomy The achlorhydria which accompanies rosacea is likewise of the functional type Gastric secretory activity is reduced in the presence of anemia and achlorhydria of the moment is to be expected in most patients with severe anemia This is a potential source of error in establishing the diagnosis of pernicious anemia Achlorhydria of both functional and anatomic types becomes more common as age advances This should probably be interpreted only as indicating that the older a person gets the more chance he has to get stomach trouble

Although achlorhydria interferes with certain physiologic *activities it of itself appears* to be responsible for no important clinical consequences In individual cases it may be difficult for one to judge the matter because often the patient has some basic disease that causes upper gastrointestinal symptoms and signs such as pernicious anemia sprue or carcinoma of the stomach Gastrogenous diarrhea a common diagnosis of the past said

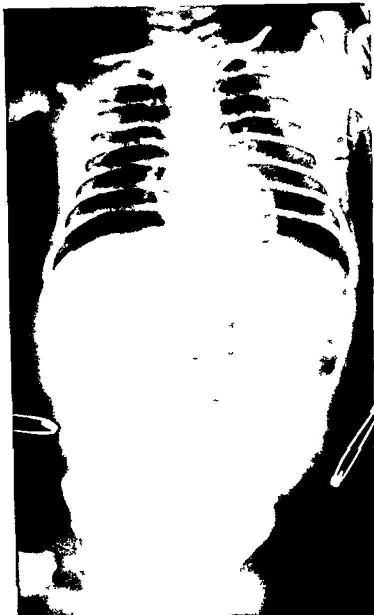


Fig 49 Plain film of neonate with complete gastric obstruction due to congenital hypertrophic pyloric stenosis There is not proper rotation to show the string sign of Hefke

function secondary pylorospasm (Czerny s syndrome) due to acute systemic infection and congenital hypertrophic pyloric stenosis The last is by far the most important and constitutes the most common indication for abdominal operation in the neonate It has a moderately strong hereditary basis several members of a family at times being affected First borns are most susceptible From 80 to 90 per cent of affected babies are males There appear to be no racial preferences

The disease seems to have both a functional and an anatomic basis It has been termed obstruction due to simple muscle hypertrophy but in addition spasm or local mucosal edema must be postulated in order

accomplished and maintained for a few days It is questionable whether the stomach should be fixed by suture to the anterior peritoneum In deciding one should note that patients treated only by reduction and decompression almost never have a recurrence of the episode

Chronic and intermittent volvulus are very much more benign problems and in many cases no illness results Large eventrations of the left diaphragm almost always contain an inverted stomach and this may remain upside down throughout the patient s life without causing any trouble Intermittent volvulus usually produces a twist which is at right angles to the cardia pylorus axis the two ends of the stomach approaching each other one anterior to the other Intermittent kinking across the pars media results Usually there is an anatomic explanation—hourglass deformity perigastritis adhesions visceroptosis duodenal mesentery abnormal gastric ligament formation gastric tumor or partial pyloric obstruction with an overloaded stomach

The clinical picture in symptomatic cases is often confusing and may be further obscured by the more basic disease There are recurrent attacks of upper abdominal pain lasting minutes or hours There may be intermittent obstruction and vomiting Contrast roentgenologic study often gives information about the deformity even between attacks Surgical treatment of the underlying disease can be expected to cure the condition Gastropexy may be indicated in an occasional case

MEGAGASTRIA AND ACUTE DILATATION

Megagastria is a general term implying chronic dilatation of the stomach and when linear elongation is especially striking the condition is known as *dolichogastria* It has many causes and accordingly variable clinical significance It is a secondary manifestation not a disease although often enough the cause cannot be identified The common explanations are chronic pyloric obstruction and simple gastroptosis The degree of megagastria is especially striking when a ptotic stomach forms part of the contents of a large scrotal hernia Less commonly megagastria is due to chronic wasting diseases prolonged immobilization as by a body spica transverse myelopathy or vagotomy without provision for gastric drainage The condition of the stomach frequently goes unrecognized and in fact often this part of the illness does not bother the patient at all A huge stomach is sometimes encountered by chance in a patient who has never vomited and whose nutrition has been well maintained Upon physical examination clapotage is often the only positive finding The lax stomach cannot be outlined by palpation

Paroxysmal megagastria of asthma is a rather special form due to uncontrollable aerophagia during asthmatic attacks

Acute dilatation is quite a different matter It frequently develops during the agony whatever the cause of death and this gave rise in the older literature to statements that acute dilatation of itself is a fatal condition It is due to acute failure of the neuromuscular mechanism of the gastric wall with passive atonic dilatation largely by its own fluid secretions There is no obstruction at the pylorus and the duodenum may in fact participate in the dilatation Usual causes are simple overloading of the stomach the immediate postoperative state acute peritonitis acute uremia acute infectious diseases and acute poisoning The condition develops over a few or several hours almost always with nausea and anorexia but rarely with pain There is very little if any vomiting until late in the course when the stomach may almost fill the abdomen Treatment consists of continuous gastric aspiration for at least several days Even though the gastric contents are liquid it may be very difficult mechanically to empty the stomach because of foldings in its lax walls

CONGENITAL HYPERTROPHIC PYLORIC STENOSIS

Neonatal disorders of the pylorus take four forms atresia which is very rare true pylorospasm (Marfan s disease) a temporary condition secondary to neuromuscular dys

than a presumptive diagnosis and if ulcer is also demonstrated the pyloric abnormality may not be recognized as such Roentgenologically a long narrow fixed pylorus is found Sometimes a smooth crescentic invagination is produced in the base of the duodenal bulb (Kirklin s sign) but this is by no means pathognomonic The degree of gastric dilatation is rarely striking Gastroscopic examination is not expected to assist the diagnosis although it is important for excluding other regional disease especially cancer

Treatment necessitates surgical relief of the obstruction Many diseases may simulate the clinical and roentgenologic picture—carcinoma of the pylorus pyloric ulcer with cicatrization encircling myoma gastric sarcoidosis eosinophilic granuloma and others Because precise diagnosis depends on histopathologic study of the lesion partial gastrectomy is ordinarily the best therapeutic procedure Plastic operations on the pylorus apparently suffice if the surgeon is willing to make a diagnosis from the gross findings

GIANT RUGAE

The gastric rugae of a small proportion of normal people are unusually broad and remain broad throughout the organ s various physiologic activities This is a normal variant not a disease The overlying mucosa is histologically entirely normal quite unlike the condition which exists in giant hypertrophic gastritis and multiple polyposis Clinical importance arises from the fact that upon roentgenologic examination giant rugae produce filling defects which have the appearance of tumor

The characteristic roentgenologic picture is that of multiple firm masses protruding from the walls Giant rugae like normal rugae are largest along the greater curvature of the pars media They may produce an apple core deformity across the pars media or across the antrum or the whole stomach may show a coarse polypoid pattern All conceivable forms of tumorous process may be simulated (Fig 50) The picture tends to remain static upon successive examinations even though they be months apart

The diagnosis is ordinarily clarified without difficulty by gastroscopic examination Giant rugae are well studied as to their conformations and the health of the overlying mucosa With progressive insufflation of the stomach the rugae gradually become narrower and less tortuous and they can sometimes be made to disappear entirely



Fig 50 Giant rugae simulating extensive antral carcinoma To the gastroscopist the antrum appeared entirely normal Repeat fluoroscopy six years later showed giant rugae as before with quite a different pattern

DIVERTICULA

Diverticulum merely refers to a gross form that a lesion may assume and several diseases can produce blind extensions from the gastric lumen *Pseudodiverticula* or pathologic excavations of the gastric wall or intramural lesions are in the majority and discussion of these finds itself drawn into several unrelated fields which are dealt with in other sections Ulcers become pseudodiverticula by virtue of the depth of their penetration Pseudodiverticula with an intact mucosa are sometimes produced close to surgical stomas as a result of operative distortions Both malignant and benign intramural tumors may undergo central necrosis and excavation Lipomas schwannomas and leiomyomas are particularly prone to do this It should be noted

to explain the latent period which immediately follows birth The pylorus has the approximate size and external configuration of an olive Its consistency is that of cartilage Microscopically there is hyperplasia as well as hypertrophy of the circular muscle fibers

Characteristically the baby appears normal at birth after a normal gestation period Other congenital anomalies are present uncommonly He suddenly begins to vomit when *from two to six weeks of age* Rarely signs do not develop until the baby is a few months old Vomiting steadily increases in frequency and severity and eventually it is carried out with great force The baby remains hungry and constantly demands food Switching from breast to artificial feedings ordinarily aggravates the condition Dehydration and weight loss quickly become serious problems and alkalosis usually develops

Upon abdominal examination the pylorus *can almost always be palpated* although the most patient examination is sometimes necessary to find it Frequently strong peristaltic waves are visible upon inspection of the abdominal wall These two findings plus the course of events since birth usually permit an accurate diagnosis Contrast roentgenographic examination does not often tell much more than is already known and many surgeons believe it to be undesirable The roentgen findings are merely those of gastric *retention peristaltic hyperactivity and a long narrow pyloric canal (string sign of Hefke)* (Fig 49)

In the majority of cases the treatment of choice is the Fredet Rammstedt type of pyloromyotomy Operation is never an emergency matter and it is important to take time to correct dehydration and alkalosis problems The surgical mortality rate is a little less than one per cent and except for the possibility of an inadequate myotomy the only important complication is unrecognized surgical perforation of the duodenum In about one quarter of the babies particularly those who do not become sick until several postpartem weeks have passed medical treatment with spasmolytic drugs suffices Atropine methylnitrate works well and it is usually administered 15 minutes before each feeding for about four months after which it is no longer required Local anesthetic agents such as oral procaine amide have some merit

There are no sequels to properly treated congenital hypertrophic pyloric stenosis Cure is permanent The patients show no special susceptibility to upper gastrointestinal disease later in life Many however grow up to be nervous people

ADULT HYPERTROPHIC PYLORIC STENOSIS

Hypertrophic pyloric stenosis of the adult has certain similarities to that of the neonate but the clinical significance is quite different It is probable that some instances represent delayed clinical appearance of the congenital form but the point cannot be determined with assurance because so rarely is x ray information available for evaluating the conditions which existed early in life In most cases the *patient first becomes sick during midadult* life Men are more often affected than women This is not a rare disease and an increasing number of reports suggests that there might be a real increase in its incidence

The pylorus is altered by both hyperplasia and hypertrophy of its circular muscle and a twofold to threefold increase in its thickness results The stomach itself may be mildly dilated Secondary muscular hypertrophy sometimes extends throughout the organ and the *mucosa of the pylorus and antrum commonly becomes hyperemic and edematous*

The symptoms are those of chronic partial *pyloric obstruction at times existing intermittently* since birth but usually appearing for the first time during adulthood upper abdominal pain aggravated by meals *distention* periodic vomiting weight loss variable nausea and anorexia and pyrosis The patients often have outspoken emotional problems Commonly either a duodenal or gastric ulcer is also present and this may complicate the clinical picture as well as etiologic thinking It is difficult to know whether the ulcer is a complication of chronic obstruction or whether the pyloric disease is a reaction to existing ulcer

Objective study usually permits no more

it is aggravated by meals and during recumbency Other patients complain of complex dyspepsias such as fullness gas deep discomfort and pyrosis Hiccups are not uncommon Physical examination gives no diagnostic help The swallowing sounds are not altered

found to develop in those of any location

Diagnosis is made by roentgenologic examination This is not an infallible method the problem being that the diverticulum may fail to imbibe the barium suspension Whenever films from an upper gastrointestinal series are examined the usual diverticulum



FIG 52 Gastric diverticulum arising at the usual site at the cardia

Complications are uncommon Spontaneous rupture and hemorrhage have been reported The latter is apparently explained by stagnation gastritis which may develop within the sac Aberrant pancreatic rests are frequently found in antral diverticula and carcinoma and benign intramural tumors are

position should automatically be checked for a gas shadow which might represent a diverticulum which has failed to fill Gastroscopic examination may be useful in distinguishing true from pseudodiverticula The former appears as a stoma like opening sometimes with rhythmic muscular activity surrounded by

that occasionally a true diverticulum develops a tumor within its fundus quite a different matter

The *formation cavitaire d origine dynamique* of Moutier is the only important functional diverticulum of the stomach To produce it a relatively minor mucosal lesion stimulates muscle contraction about itself in such a way that a relatively large spastic pouch is formed usually extending a centimeter or two from the gastric profile (Fig 51) The pouch may persist several hours and may recur at intervals It constitutes a hazard for roentgenologic interpretation often seeming to represent a large deep ulcer Gastroscopic study usually permits recognition of the nature of the defect



FIG 51 Formation cavitaire d origine dynamique of Moutier This crater like lesion shown in profile appeared to be an ulcer upon roentgenologic examination but gastroscopically only a couple of minor erosions were found in the area Repeated roentgenologic study on two occasions within the same week failed to demonstrate any abnormality in the area

True gastric diverticula are encountered in about 0 004 per cent of general hospital admissions 0 04 per cent of upper gastrointestinal roentgenologic examinations and 0 02 per cent of routine autopsies Bold figures like this always contain important inherent inaccuracies but in this case they at least indicate that the gastroenterologist can expect to encounter true diverticula infrequently About three quarters of the lesions arise just below the esophagogastric junction from the posterior wall close to the lesser curvature (Figs 52 and 53) The others are scattered at random over all parts of the stomach Double and multiple diverticula are distinctly rare Most true diverticula measure between 1 and 6 cm in diameter when distended but diameters of 11 cm and more have been reported There is no sex preference

Most diverticula are not discovered until the patients have reached the fourth to sixth decades of life even though a congenital muscular defect is believed to be at fault

Some true diverticula remain entirely asymptomatic and are discovered merely by chance at the time of autopsy or during roentgenologic study for other disease There is little question that others may be responsible for illness although in certain patients it may be difficult to decide the point except by exclusion Frequently other upper gastrointestinal disease exists making it seem likely that the diverticulum is merely a chance finding But in a sizable proportion of cases the results of surgical extirpation leave no doubt that the diverticulum was at fault In about half of symptomatic cases the complaint is epigastric or low-chest pain without radiation The pain is intermittent and frequently

stomach at the time and the health of the gastric wall at the perforation site If the stomach of the healthy living adult is distended very gradually it does not burst until it reaches a capacity of about 6000 ml On the other hand a sudden increase of pressure in the partially filled organ may cause rupture Spontaneous rupture in the apparent absence of mural disease has been reported following large meals drinking bouts and the use of effervescent powders The fundus has been involved in about one third of the cases the lesser curvature in one third and the two walls or greater curvature in the rest Two simultaneous ruptures have rarely been observed The tears may be as long as 12 cm Because the organ is usually overfilled at the time and because the rupture is usually extensive immediate inexorable collapse occurs and death may follow quickly

Perforation due to local injury or mural dissolution is much commoner than rupture and here ulcer malignant tumor and instrumentation are the usual causes If the stomach at the time contains only air as it does during gastroscopy little peritoneal harm results Liquid and semisolid contents on the other hand produce a serious chemical and secondary bacterial peritonitis and it is peritonitis of course which is the important threat following perforation of gastric ulcer and gastric cancer Posterior perforations open into the lesser peritoneal sac and spilled material must then pass through the foramen of Winslow before the general peritoneal cavity can become contaminated There is a remarkable tendency for small holes to close off quickly with the help of the omentum and local peritoneal surfaces Often at laparotomy performed soon after a gastric ulcer has perforated the surgeon finds that the site has become sealed The two local conditions which preclude spontaneous closure are tumor and gangrene secondary to mural infarction

Spontaneous gastric rupture in the neonate is an entity in its own right It appears to be due in most cases to a congenital defect of the gastric musculature Rarely pyloric atresia may be at fault Most affected babies are males Often the rupture occurs on or near the greater curvature and it may be from 2 to 5 cm in length No sudden catastrophic event is recognizable clinically The baby becomes sick quickly usually during the first week of life There is cyanosis semicoma tachypnea and sometimes convulsions Liver dullness disappears and distention develops X ray examination shows free abdominal air and absence of a gastric air bubble The need for laparotomy will be recognized upon discovery of pneumoperitoneum but precise diagnosis must await the operative findings Cure by surgical repair is possible

Instrumental perforation of the stomach is a rare accident and almost all instances these days occur during gastroscopy Perforation occurs in about 0 03 per cent of gastroscopic examinations The risk is governed by the design of the gastroscope the health of the gastric wall and the skill of instrumentation Because the stomach is empty at the time this is a relatively innocuous accident Often the examiner leaves the patient with no realization that injury has been done Almost all instrumental perforations occur through the posterior wall near the lesser curvature and close to the esophagogastric junction These are then perforations into the lesser sac On occasion the perforation cannot be demonstrated at laparotomy in spite of vigorous attempts to locate it and some observers believe that insufflated air may pass through the gastric wall without producing an actual wound

Treatment of instrumental gastric perforation should be conservative Continuous gastric aspiration for three to five days and prophylactic administration of penicillin and streptomycin are the important measures If massive pneumoperitoneum has been induced by unwitting insufflation of the peritoneal cavity considerable relief can be afforded by drawing off the air by percutaneous needle

EXTRINSIC PRESSURE INFLUENCES

Extragastric masses which impinge on the stomach may cause total organ shift or mere localized indentations The organ is so plastic that trouble rarely results but the changes in gastric configuration offer diagnostic help

normal appearing mucosa and containing a pool of secretion and food Passage of the gastroscope is not dangerous in cases of true diverticulum because the lesion does not lie in the instrument s path

of the severity of symptoms that seem ascribable to the lesion Many times operation will be considered worse than the illness It may be surprisingly difficult for the surgeon to find the diverticulum even though he knows

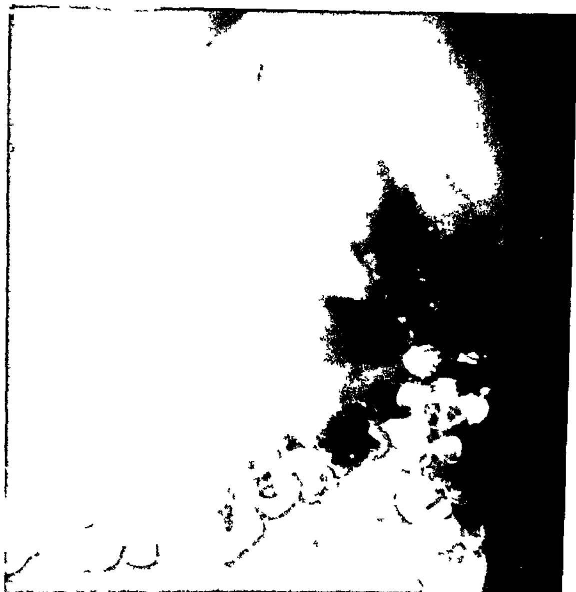


Fig 53 Retention of barium suspension by diverticulum shown in Figure 52 six hours following barium meal

from the roentgenologic study exactly where it lies

Surgical amputation is the only useful therapeutic measure Occasionally the patient will have discovered some little trick to help him obtain relief such as quickly drinking a glass of water after each meal and this will suffice Decisions regarding operation can be made only on the basis

RUPTURES AND PERFORATIONS

Rupture of the stomach may or may not be a catastrophic event depending on the nature of the injury the material in the

stomach at the time and the health of the gastric wall at the perforation site If the stomach of the healthy living adult is distended very gradually it does not burst until it reaches a capacity of about 6000 ml On the other hand a sudden increase of pressure in the partially filled organ may cause rupture Spontaneous rupture in the apparent absence of mural disease has been reported following large meals drinking bouts and the use of effervescent powders The fundus has been involved in about one third of the cases the lesser curvature in one third and the two walls or greater curvature in the rest Two simultaneous ruptures have rarely been observed The tears may be as long as 12 cm Because the organ is usually overfilled at the time and because the rupture is usually extensive immediate inexorable collapse occurs and death may follow quickly

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Extragastric masses which impinge on the stomach may cause total organ shift or mere localized indentations The organ is so plastic that trouble rarely results but the changes in gastric configuration offer diagnostic help

for localization and identification of the primary diseases Although retrogastric tumorous processes may prevent passage of the gastroscope both roentgenologic and gastroscopic examinations may furnish helpful information

duces is easily predicted and identified as a broad even depression rather high on the greater curvature The transverse colon which is distended with gas or feces produces an indentation across the greater curvature and anterior wall Greater curvature cancer may



Fig 54 Hourglass stomach An active benign ulcer of the lesser curvature at the site of stricture had been treated 14 months previously At the time this film was made the patient was asymptomatic

Small tumors and cysts of the pancreas cause indentation of the posterior wall of the pars media and antrum Retroperitoneal lymph nodes which contain tumor may do the same Liver tumors may shift most of the stomach inferiorly although usually the cardia maintains its normal position regardless of liver size Because splenic enlargement is always generalized and uniform the defect it pro

be closely simulated Less commonly gastric defects are caused by aortic aneurysm or by tumors of the left diaphragm left kidney or left adrenal gland

Direct invasion of the gastric wall by impinging tumors is not rare the most frequent form being carcinoma of the pancreas Primary gastric carcinoma may invade the pancreas too and sometimes at autopsy it is

not possible to decide in which organ the tumor originated Other less common invading tumors are those of the gallbladder transverse colon retroperitoneal nodes kidney and adrenal gland

OTHER MECHANICAL AND CONFIGURATION DEFECTS

An *hourglass stomach* is one which has been narrowed across its midportion by circumferential cicatricial contracture secondary to benign lesser curvature ulcer (Fig 54) Actual obstruction never occurs Although infiltrating carcinoma can produce the same deformity the term is reserved for benign processes

Microgastria is a poorly defined term which has as its least controversial meaning merely congenital shortness of a stomach which is unable to dilate normally to the demands of filling It is extremely rare

Dextrogastria as an isolated abnormality is also very rare In association with situs inversus totalis it is found in one of every 6000 to 8000 people It has no clinical significance Patients who have dextrogastria are best placed in the right lateral position for gastroscopic examination Gastroscopy then is quite satisfactory the picture mirroring the normal

An *antral diaphragm* a very rare congenital lesion is a narrow perforated atretic mucosal septum which partially divides the antral lumen It is interesting to note in this connection that the stomach is almost exempt from the atresias The picture of chronic partial obstruction may develop Treatment is easily accomplished by surgical obliteration of the septum

Gastroduodenal intussusception is usually initiated by a polypoid gastric tumor which has been carried through the pylorus Apparently in rare instances a good portion of the gastric wall may be pulled down into the duodenum Serious hemorrhage has been reported as a complication The clinical picture is that of acute gastric obstruction Roentgenologic diagnosis is possible but the important thing is that the urgent need for surgical help be recognized from the clinical picture

Gastrogastric invagination and retrograde duodenal mucosal prolapse have been described but are poorly known diseases

ARTERIAL DISEASES

INFARCTION

Major vascular accidents of the stomach are rare An arterial occlusive process must be extremely extensive before general gastric ischemia becomes significant Even when all but one of the gastric arteries are ligated as was once advocated for the treatment of ulcer the submucosal arterial plexus is extensive enough to assure satisfactory circulation The efficiency of the mucosa s secretory activities is little affected by such radical devascularization If all gastric arteries are occluded of course total gastric infarction results

Spontaneous transmural gastric infarction has been described only a few times No survivals have been reported In one third of the cases there was infarction of the entire organ and occasionally the small intestine and part of the colon participated in the accident An explanation for arterial insufficiency was evident in most reported cases—aortic aneurysm involving the celiac axis embolism of the celiac axis prolonged shock or arterial injury during gastrectomy In some instances there was merely severe chronic heart disease particularly cor pulmonale In about one third of reported cases clinical and autopsy study failed to supply an explanation

Paradoxically even though major artery occlusion leaves the stomach unaffected an erosion or actual ulceration results when a tiny embolus reaches the mucosa Vascular plugging leads to focal hypoxia depressed local mucosal resistance and autodigestion Fat embolism secondary to fractures or marrow curettement and bacteremia embolization are the usual causes An *interesting rare* mechanism is retrograde embolization of the mucosal veins This is the explanation for

the shower of acute gastric ulcers which sometimes follows resection of the greater omentum or experimental injection of particulate matter into an omental vein

ARTERIOSCLEROSIS

Although the gastric arteries seem nearly immune to arteriosclerotic changes occasionally a sclerotic aneurysm develops along their extragastric course This happens almost exclusively in men unlike splenic artery aneurysms The only other sclerotic manifestation of note is intramural arterial sclerosis which on rare occasions ruptures and leads to massive hemorrhage into the gastric lumen A segment of submucosal artery becomes tremendously thickened and tortuous elevating the mucosa in a characteristic pattern This can be recognized gastroscopically but not roentgenologically It is a process found almost only in men When hemorrhage occurs exsanguination ordinarily results unless emergency gastrectomy is done The specimen shows that the break in the mucosa over the artery is very small

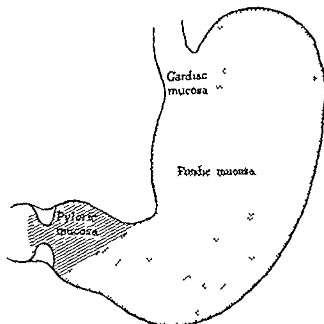


FIG 55 Distribution of the three normal histologic types of gastric mucosa

GASTRITIS COMMON GASTRITIS

Few will disagree that thinking on diffuse gastric mucosal disease has in the past been surrounded by an unusual degree of enigma and prejudice and that it is still difficult to find areas of general concord when considering either the clinical implications of gastritis or its histopathologic meanings Few will disagree either that gastritis has been an overworked diagnosis too often used in the role of a diagnostic excuse Clinical acceptance of the concept of gastritis was for a long period largely based on clinical expediency The state of turmoil in which gastritis finds itself currently is actually a healthy one for without a degree of ambivalence at this stage it could easily die of its own neutrality

Gastritis is many diseases some of specific etiology some of uncertain or nonspecific nature The latter are usually referred to as common gastritis and it is this which is responsible for most of the interpretational problems Common gastritis is best thought of as one histopathologic disease

with several morphologic stages These may be classified in this way

I Acute nonspecific gastritis
  A Degenerative
  B Hemorrhagic
II Chronic nonspecific gastritis
  A Reactive
    1 Degenerative
      (a) Degenerative phase
      (b) Regenerative phase
    2 Atrophic
      (a) Inflammatory stage
      (b) Quiescent stage
    3 Hyperplastic (diffuse localized)
    4 Lymph follicular

HISTOPATHOLOGIC FEATURES

It is necessary to think in terms of a histo pathologic classification as given here be cause it helps in understanding the unity of common gastritis as well as the tendencies towards certain complications By histopath ologic study of serial mucosal biopsies it can be shown that acute nonspecific gastritis heals without pathologic residuals and that chronic gastritis does not represent the con sequences of prior acute insults to the stom ach Similarly there are no mucosal changes which normally accompany the aging process In the chronic type of nonspecific gastritis it is possible to find successive histopathologic steps from the simple degenerative form through all of the others The forms which are spoken of as morphologically distinct by the gastroscopist represent histopathologic stages of a single process

Even though the one does not lead to the other both acute and chronic nonspecific gastritis appear to have the same type of tissue frailty as the basic pathologic change this being reiteration of the pathologist s truism that a tissue responds to noxious in fluence in its own fasion with little regard to the specific nature of the influence The frailty exists in the mucosa s neck stratum where the glandular portion of the tubules joins the foveolae (Fig 56) This is the mucosa s generative layer and biologically it is the most active The neck cells are con siderably less resistant to hypoxia and circu lating toxins than the other cellular types Thus in the acute gastritis which follows ingestion of a toxic agent such as alcohol or poisoned food the damage is not exerted against the mucosa s epithelial surface but against the neck layer indicating that the injury is a hematogenous one This native resistance of the mucosal surface is one of the important characteristics of the stomach Classical experiments show that the skin is less resistant to strong agents than the mucosa and many oral drugs in common use will burn the skin by mere surface contact

The effects of necrobiosis through the neck stratum are two extrusion of unaltered chief and parietal cells leading eventually to glandu lar atrophy and exfoliation of superficial bits of mucosa producing erosions The first is a stage in the progression to atrophic gastritis while exfoliation and erosion formation may occur at any stage prior to complete atrophy Meanwhile diffuse inflammation spreads through the lamina propria and the surface epithelial cells undergo secondary changes Lymph follicles sometimes develop through the mucosa With chronic loss of chief and parietal cells atrophy progresses so that during the final stage the mucosa may con sist of little more than a single layer of columnar cells overlying the muscularis mucosae Hyperplasia of the surface and foveolar cells with adenoma formation is an occasional end result Much more often the process becomes static at some point along its course

ACUTE NONSPECIFIC GASTRITIS

Although the pathologic changes have no specific characteristics several specific agents and circumstances may cause this disease The usual offenders are acute alcoholism food poisoning drug and food sensitivities certain acute systemic diseases uremia cholemia and acute exogenous poisoning The infectious diseases which are particu larly likely to be accompanied by acute gastritis are the pneumonias streptococcal infections influenza scarlet fever and diph

the shower of acute gastric ulcers which sometimes follows resection of the greater omentum or experimental injection of particulate matter into an omental vein

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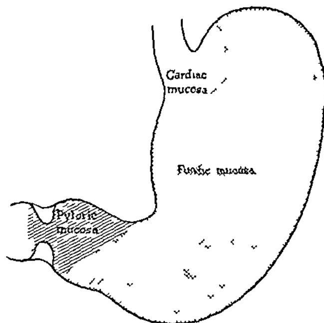


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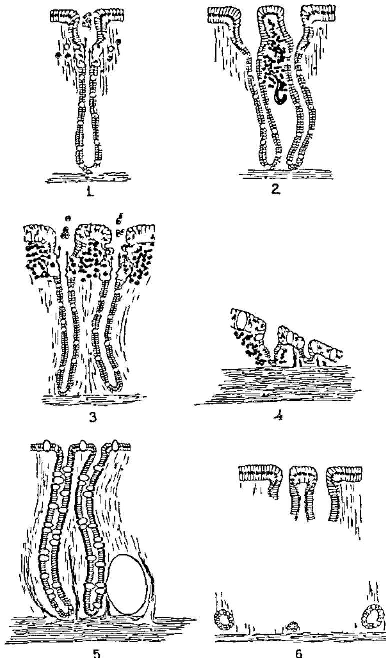


FIG 57 The histopathologic progression of common chronic non specific gastritis Hematogenous or other influences cause necrobiosis at the neck stratum (*1*) or local hemorrhage leads to hypoxia of the same area (*2*) Gland cells are extruded the surface cells undergo in jury there is chronic inflammatory exudation and the foveolae may show evidences of rapid regeneration (*3*) The result of necrobiosis and shedding of gland cells is atrophy and at this stage the inflamma tory infiltration may disappear (*4*) The foveolae may at times un dergo extensive hyperplasia (*5*) Apparently at any stage well devel oped lymph follicles may form through the mucosa (*6*)

theria The heavy metals most often responsible for recurrent acute gastritis due to their excretion by the gastric mucosa are tellurium mercury copper zinc lead and chromium All of these injurious agents or influences reach the mucosa via the hematogenous route and exert their maximum damage against the neck stratum

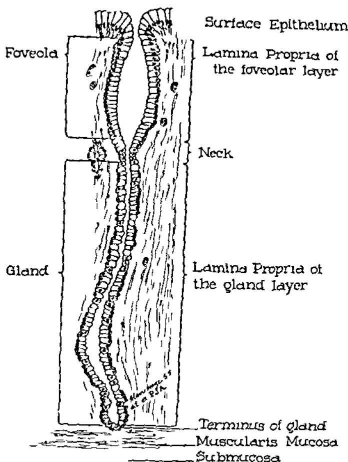


FIG 56 The parts of the normal gastric mucosal tubule

A special word is necessary about certain common drugs and their role in producing gastric injury Certain ones such as cinchophen phenylbutazone cortisone and corticotropin can activate and in some cases produce ulcer in addition to causing diffuse mucosal damage Large doses of morphine and doses of insulin in excess of physiologic needs rather regularly lead to erosive gastritis In certain patients there is an idiosyncrasy to the sulfonamides aminophylline Aureomycin and other drugs and acute gastritis sometimes with hemorrhage regularly follows medication by whatever route Usually neither the patient nor the clinician becomes aware of the mucosal damage unless there be hemorrhage or unless for some reason gastroscopic examination should be done because the gastritis itself does not necessarily produce symptoms Certain other drugs such as nitrogen mustard rather regularly cause upper gastrointestinal symptoms but the cause here is muscular irritability not mucosal damage There is considerable individual variation in mucosal tolerance to circulating salicylates and it is important to note that intravenous salicylate administration is just as effective as oral salicylate administration in causing gastrointestinal symptoms and in producing mucosal damage The gastric

If the clinical importance of chronic gastritis as an explanation for upper gastrointestinal symptoms must be de emphasized the opposite is true for the complications of chronic gastritis The main one is hemorrhage which is discussed elsewhere The carcinogenic implications of chronic gastritis are still unclear but it is known that gastric cancer is usually associated with atrophic gastritis and that the hyperplastic process which may become superimposed on atrophic gastritis is the type of process which in other parts of the body has malignant potentialities Certainly the high incidence of gastric adenomas and cancer among patients with pernicious anemia is a strong argument for the malignant potentialities of atrophic gastritis It cannot be determined as yet whether atrophic gastritis should be considered cause or effect of the undernutrition syndrome of young postmenarche girls which is characterized by atrophic gastritis severe weight loss with fair food intake dyspepsia absence of significant anemia and absence of signs of specific deficiencies

Diagnosis of chronic gastritis can be established only by gastroscopic examination and by gastric mucosal biopsy Roentgenologic study is not useful for detecting gastritis nor is gastric analysis Chronic gastritis is seldom a diffusely uniform disease so that a mucosal sample removed by blind biopsy may be misleading Gastroscopic interpretation is more difficult than once thought but gastroscopy remains the best method for diagnosis well supplemented by biopsy Early gastroscopic examination is particularly important when gastritis is the source of hemorrhage The gastroscopic signs depend on the stage of gastritis in the earliest form chronic degenerative gastritis there are patchy hyperemia mucosal dullness surface exudate and frequently scattered petechiae and erosions After a long interval which may amount to years the picture in some patients gradually gives way to that of atrophic gastritis Here loss of gland cells gives the mucosa a gray blue transparent quality permitting visualization of submucosal veins When hyperplastic gastritis supervenes isolated crinkled excrescences or smooth adenomatous polyps are found

Treatment is not indicated for the mucosal disease itself in cases of chronic nonspecific gastritis The gastritis should be ignored in favor of therapy aimed at psychogenic and organic disease elsewhere As far as the purely objective aspects of the mucosal disease are concerned it must be admitted that no way is known to alter the pathologic progression and as stated even the gastritis of pernicious anemia which is under adequate therapy shows no improvement

ALCOHOLISM AND GASTRITIS

A significant portion of acute degenerative cases are due to imbibition of large amounts of alcohol over a short period It is caused by circulating alcohol not surface contact and it can be produced experimentally by administering alcohol intravenously This gastritis heals quickly without residuals

Chronic gastritis on the other hand is not of alcoholic origin There is no more chronic gastritis among chronic alcoholics than among abstainers Experimental attempts to produce persistent or chronic alcoholic gastritis have failed

"GIANT HYPERTROPHIC GASTRITIS

This rare condition is to be distinguished from the anomaly of giant rugae and from hypertrophic gastritis Large folds—not true rugae—are formed in giant hypertrophic gastritis by fibrous septal extensions which arise from the submucosa (Fig 58) It is important to note that the folds are fixed unlike rugae If the extensions take the form of cores as well as septa polyps are also produced Only the overlying mucosal disease is significant pathologically and this can always be broken down into one of the common types of chronic gastritis However in this unique situation the histopathologic picture may vary considerably from area to area over the mucosa

The clinical importance of giant hypertrophic gastritis lies in the confusion it

bleeding which an occasional susceptible person may show during prolonged salicylate therapy may be partly blamed on mild hypoprothrombinemia secondary to salicylate interference with the liver's utilization of vitamin K.

Acute gastritis is ordinarily easily suspected from the clinical circumstances, the acute gastric upset perhaps, and at times bleeding. *An assured diagnosis can be made only by* gastroscopic examination, but unless there be hemorrhage the clinical situation may not often demand that the diagnosis be proved. It is a self limited disease, and heal*ing often proceeds rapidly*.

CHRONIC NONSPECIFIC GASTRITIS

Common chronic gastritis seems to develop as a reaction to some more basic *disease process. It is not true that most* people have chronic gastritis, as is sometimes said. Although at times it develops in people who seem otherwise to be well, the gastric mucosa of the great majority of *people who believe themselves to be healthy* is normal. Frequently chronic atrophic gastritis, the end stage of degenerative gastritis, is associated with one of a few well known diseases: carcinoma of the stomach, pernicious anemia, sprue, and chronic wasting diseases. In some, such as tuberculosis, it is assumed that simple debilitation and faulty nutrition must be important etiologic factors. Chronic atrophic gastritis is the anatomic explanation for the permanent type of achlorhydria. The stomach which has been operated upon with the formation of a gastroenterostomy rather regularly shows the regenerative phase of reactive gastritis, a remarkably static pathologic process.

The chronic atrophic gastritis of pernicious anemia goes through both active inflammatory and quiescent stages, just as does idiopathic atrophic gastritis. Gross and microscopic evidence of *active inflammation* is common. Histopathologically, the gastritis is generalized, although upon gastroscopic inspection of the patient whose anemia is in remission it appears to be patchy. Specific adequate and long term therapy for pernicious anemia does not improve the histopathology of the gastric mucosal disease one whit.

Uncomplicated chronic nonspecific gastritis rarely causes sickness. To put it more practically, rarely can upper gastrointestinal symptoms be correctly ascribed to chronic gastritis. It is not possible to force a cor*relation between the symptomatic and the* pathologic pictures, nor is there a recognizable symptomatic pattern among patients who have common mucosal disease. The patient with the sickest looking stomach is not *necessarily sick. In brief,* the presence of gastritis does not automatically indicate illness. Its discovery can prove a disservice if it turns attention away from the patient as a whole and in particular from his func*tional problems*.

As an interesting commentary on the confusing interpretational problems which gastritis has created, one might consider the saga of "hypertrophic gastritis." This was *previously* a very common gastroscopic diagnosis, its main endoscopic signs being the presence of "pebbling" over the mucosal surface and alteration of the mucosa's translucent quality. The two main objections to the concept of "hypertrophic gastritis" were that its distribution through the stomach seemed to shift too quickly to be explainable on histopathologic grounds and that the gastroscopist was encountering it very much *more frequently than the pathologist. The* ghost of "hypertrophic gastritis" was laid away when recently developed transoral biopsy technics necessitated admission that mucosa which to the gastroscopist shows the *abnormality appears normal to the pathologist*. The "pebbles" are in reality areae gastricae which are made to stand out prominently and alterations in surface translucency are probably due to fluid shifts—both explained by hypertonicity of the muscularis mucosae. The symptoms of the patient with "hypertrophic gastritis" are real enough but they have a functional basis. A tense mucosa is one of the manifestations

These are called hemorrhagic erosions Dieulafoy s hemorrhagic erosion is the term sometimes applied to those which cause hematemesis in patients with pneumococcic pneumonia

The ubiquity of erosions is a rather remarkable fact of gastrology Clinically the importance is hemorrhage One might hope that their study would help in understanding the etiology of ulcer but this is not so in fact erosions are conspicuous by their absence when gastric ulcer is present

SPECIFIC GASTRITIS

The various forms of specific gastritis may be classified as follows

- I Acute specific gastritis
  - A Corrosive
  - B Phlegmonous
  - C Emphysematous
- II Chronic specific gastritis
  - A Granulomatous (tuberculosis syphilis sarcoidosis actinomycosis eosinophilic foreign body)
  - B Postirradiation
- III Miscellaneous processes not actually gastritic
  - A Embolic gastritis
  - B Storage processes (amyloidosis hemosiderosis hemochromatosis the lipoidoses)
  - C Endogenous trauma (retained foreign bodies hyperactivity)
  - D Allergic

CORROSIVE GASTRITIS

Corrosive poisons unlike other toxins damage the stomach from the surface epithelium downward In contrast to the situation in the esophagus alkalies are much kinder to the stomach than acids All of the various agents which are capable of doing injury cause about the same type of damage Maximum immediate injury is generally produced at the cardia and at the pylorus although apparently the stomach may react quickly by spasm retaining the corrosive and encouraging destruction in other areas Antral and pyloric stenosis is the important late sequel When the agent is a strong acid severe cicatricial gastric disease may develop even though the esophagus has escaped damage entirely Pyloric stenosis may follow alkali corrosion but in such cases esophageal injury is more severe than gastric

PHLEGMONOUS AND EMPHYSEMATOUS GASTRITIS

These represent response to actual infection of the gastric wall They are dangerous fulminating pyogenic bacterial processes which in most cases become established during or just after operative manipulation of the stomach In other cases infection apparently enters the gastric wall through a local lesion such as ulcer or carcinoma The entire thickness of the wall becomes infected although most of the exudate remains in the submucosa The reaction may remain localized in the form of multiple acute abscesses or it may spread quickly to become a seropurulent pangastritis Rupture of localized pus pockets through the mucosa with formation of an acute gastric carbuncle is common Gangrene with rupture into the abdominal cavity is not

There is a subacute type of phlegmonous gastritis characterized by formation of scattered chronic abscesses with both necrosis and granulomatous reaction Emphysematous gastritis is a very rare form of phlegmonous gastritis caused by gas forming organisms

Frequently the illness develops as an acute abdominal emergency with severe pain localized upper abdominal peritonitis and a rapidly progressive septic course In the patient who has recently had a gastric operation the common complication of disruption of a suture line is likely to be suspected first Unless pus is recognized in the patient s vomitus or unless in the case of emphysematous gastritis gas can be recognized roentgenologically in the gastric wall the diagnosis cannot be more than a clinical guess in acute fulminating cases When phlegmonous gastritis assumes a less acute course roentgenologic and gastroscopic examinations may

may cause in roentgenologic diagnosis Alterations produced in the configuration of the gastric lumen may simulate those of cancer exactly and many cases end in gastrectomy The problem is entirely a diagnostic one there being no tendency toward malignant change Achlorhydria of the permanent type is found in those cases in which there is generalized atrophic gastritis Weight loss

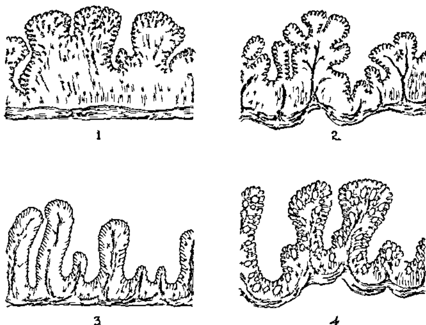


FIG 58 The various configurational explanations for giant hypertrophic gastritis Only the mucosal changes themselves are of actual importance but the large surface foldings caused by the fibrous septal extensions from the submucosa may cause diagnostic confusion

and hypoproteinemia have been reported in some instances

GASTRITIS COMPLICATED BY EROSION

There is hardly a clinical situation in which discovery of gastric erosions should cause surprise They accompany many organic lesions of the stomach—neoplasms the gastritides granulomas and traumatic disease The gastroscopist sometimes finds them in normal control subjects They are often encountered by the pathologist during autopsy both of healthy persons who have met sudden death and of chronic invalids It is fair to state categorically that almost all stomachs become superficially eroded from time to time in response to the usual strains of living Rarely in clinical medicine does one know anything about the presence of mucosal erosions and in healing they leave no scar or other residual

A gastric erosion is a focal loss of surface tissue extending no deeper than the base of the mucosa s glandular layer Because almost all erosions are produced by dehiscence of the foveolar layer from the glandular layer the base of most lies just below the neck layer of the surrounding mucosa Several types of influence can destroy the integrity of the neck cells hematogenous poisoning which leads to local necrobiosis sudden mucosal engorgement especially when it is part of the alarm reaction the hypoxia which chronic venous stasis and plethora may cause as in portal hypertension any process which produces mucosal ischemia such as opening of the gastric wall s arteriovenous shunts and actual interstitial hemorrhage into the mucosa s neck layer The last type of erosion may sometimes be predicted by the gastroscopist when he finds mucosal petechiae

changes appear to have no clinical significance although the basis for tertiary gastric syphilis is presumably established during the early stages

Tertiary lesions of the stomach have been found at autopsy in approximately 0 3 per cent of old syphilitic patients Actually it is difficult to know about the incidence of gastric involvement because most gastric lesions cause no symptoms and all are eradicated by adequate antisyphilitic therapy Diagnosis depends entirely on recognizing certain gross characteristics in the gastric lesion of a patient with serologic proof of syphilis therefore roentgenologic and gastroscopic interpretations are paramount in clinical thinking Histopathologic study provides no specific information for establishing the diagnosis and demonstration of *Treponema pallidum* in the lesion is almost never possible A truly classic gumma never forms in the stomach apparently the stomach and the aorta are the only organs of the body in which true gummas have not been described

The gross configurations which are typical of gastric syphilis represent different stages in the evolution of a single process First there is a plaque of intramural infiltration with flattening of the overlying rugae This is a soft thickening and the softness of it must be emphasized It usually starts in the distal half of the stomach Occasionally there may be more than one focus As the plaque expands laterally it grows in thickness The



FIG 59 Extensive tertiary syphilis of the stomach involving the distal two thirds of the organ The configuration returned to relative normalcy following antisyphilitic therapy

suggest the inflammatory nature of the disease

There have been several reports of cure with penicillin Aureomycin and streptomycin Because of the urgency for starting antimicrobial therapy and the difficulty in obtaining the responsible organism for sensitivity studies penicillin and streptomycin are probably best for routine use In suspected cases nevertheless the blood and gastric aspirates should be cultured expeditiously Usually the diagnosis cannot be made until laparotomy The decision regarding resection must be based on the findings in the individual case and no general principles can be given Gastric surgery is hazardous under these circumstances unless the disease is localized to the distal stomach

TUBERCULOSIS

Tuberculosis of the stomach occurs in about 0 1 per cent of patients admitted to tuberculosis hospitals and about 0 6 per cent of tuberculous patients who come to autopsy Its rarity is explained by the fact that swallowed tubercle bacilli apparently are not able to become established in the stomach Probable reasons include the integrity of the mucosal surface and its mucous barrier the relative paucity of lymphoid tissue in the gastric mucosa and the possibility that a local immune reaction exists Gastric juice itself has no injurious effect on tubercle bacilli Primary gastric tuberculosis has never been proved

The great obstacle to clinical recognition of gastric tuberculosis is clinical unfamiliarity with the gross forms it may assume It is believed that infection usually reaches the stomach via the blood stream Disease begins in the submucosa The antrum and lesser curvature of the pars media are most often affected Although classification of the shapes that the lesions may eventually display is a rather arbitrary matter there are four main categories for one to note ulcerous infiltrative tumorous and sclerosing About 75 per cent of the lesions are mainly ulcerous developing from multiple sinuses which break through from the submucosa The result is a shallow serpiginous ulcer with deeply undermined edges It may reach a diameter of 15 cm but nevertheless interferes very little with gastric motility Although burrowing sinus tracts commonly develop perforation is very rare The infiltrative form tends to remain in the submucosa and although it may progress to cicatrizing linitis plastica its more usual form is that of an annular antral thickening The tumorous form tends to create lumps in the stomach wall These undergo caseation early The sclerosing form causes contractions and in addition has a prominent inflammatory component which may lead to adenomatous proliferation

Whatever form the infection assumes the main gross change produced in gastric configuration is antral or pyloric obstruction Sometimes constriction lies more orad so that an hourglass deformity is produced In about 10 per cent of cases tuberculosis of the stomach is accompanied by or complicated by gastric carcinoma Causal relationships are not clear

Diagnosis depends on clinical acumen roentgenologic findings and gastroscopic impressions Much depends on gross configurations relatively unaltered gastric motility and on occasion endoscopic recognition of mucosal tubercles in the vicinity of the main lesion The diagnosis can seldom be entertained if there is believed to be no tuberculosis elsewhere

Treatment is that of the primary infection usually pulmonary Surgical relief of gastric obstruction is not often necessary but often the diagnosis is not made until after the stomach and its disease have been resected on the preoperative assumption that tumor was present

SYPHILIS

The stomach is always involved during the spirochetemia of primary syphilis of course and during the secondary stage the mucosa frequently shows evidences of nonspecific gastritis—patchy hyperemia surface exudate and erosions These sympathetic

changes appear to have no clinical significance although the basis for tertiary gastric syphilis is presumably established during the early stages

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center is thickest and here ulceration develops before long The ulceration represents sloughing of superficial tissue secondary to relative ischemia It is never deep and its base is usually elevated into the gastric lumen by the thickness of the underlying plaque Frequently several ulcers develop and coalesce producing an irregular outline However extensive ulceration becomes it remains superficial The edges slope never being undermined and they and the base frequently have a bright angry multicolored appearance on gastroscopic inspection Most of the stomach may eventually become involved although it is said that 100 per cent involvement never occurs (Fig 59) Deep scarring and contraction occur late and then the configurational changes become dominated by such deformities as linitis plastica antral stenosis, hourglass deformity and fundal contraction In spite of these extensive alterations mural pliability remains There is much less interference with gastric motility than one might expect

Specific antisyphilitic therapy produces the most spectacular change to be encountered in gastrology The stomach becomes normal in all its gross manifestations There is no specific way to confirm the diagnosis prior to treatment but suspicion of gastric syphilis based on serologic findings and roentgenologic and gastroscopic study warrants treatment for syphilis rather than surgical exploration Neoplasm is simulated and always there will at first be a degree of uncertainty over the syphilitic nature of the lesion but the diagnostic specificity of medical treatment is so striking that it must be carried out first

OTHER GRANULOMAS AND PROCESSES

Sarcoidosis of the stomach is rare It occurs in two forms scattered miliary granulomas which may on occasion be associated with severe hemorrhage from the mucosa (Fig 60) and dense accumulations of small granulomas at the pylorus producing obstruction Diagnosis is sometimes possible by vacuum tube mucosal biopsy

Eosinophilic granuloma is primarily a disease of the antrum and chronic obstruction is the usual manifestation Only about 25 cases have been reported to date About half of the patients were in the sixth decade of life at the time of diagnosis



FIG 60 Sarcoidosis of the gastric mucosa in specimen obtained by mucosal biopsy

Amyloidosis may rarely cause localized gastric tumors Amyloid bodies sometimes form in an otherwise normal gastric mucosa

Gastroconiosis or foreign body granulomatosis of the gastric mucosa may result from long administration of insoluble particulate medications Chalk kaolin and silica are usual offenders (vide infra)

Postirradiation gastritis is a serious occasional sequel to x irradiation therapy of abdominal tumors The gastric mucosa has in long term effect an all or none response to x irradiation The tolerance range although variable is relatively high compared with that of certain other tissues Significant damage can be expected in a portion of cases if more than 4000 r depth dose is delivered

over the stomach during a three or four week period Doses below tolerance may lead to mild epithelial changes but there is spontaneous return to normalcy after a few months Doses in excess of tolerance may produce remarkably chronic gastric ulcers gastric perforation gastrocutaneous fistula and antral stenosis

The gastric mucosa has a degree of inherent resistance to ingestant *allergens* Allergens applied to the serosal surface of isolated stomach preparations may throw the organ into violent contractions but there is no muscular response when the same allergens are applied to the mucosa Nevertheless simple ephemeral edema of the gastric wall sometimes develops in response to both parenteral and ingested allergenic agents Even a small degree of antral edema may cause temporary obstruction and the roentgenologic picture may simulate that of tumor This is the ghost tumor of the European literature It has been reported several times following bee wasp and other hymenopteran stings

BENIGN EPITHELIAL TUMORS

This is a heterogeneous group of tumors They are lesions which are easier to think about in histopathologic than in clinical terms but their microscopic structure is most variable and their classification and anatomic interpretation are not always easy Simple delineation of benignancy from malignancy is often difficult enough if two pathologists are involved Some of the tumors contain both epithelial and nonepithelial elements Most usually assume a polypoid form but the term polyp must not be used without modification as a synonym for benign epithelial tumor

A suggested classification of benign epithelial tumors of the stomach is as follows

I Simple adenomas
  A Isolated
  B Part of generalized gastrointestinal adenomatosis
II Hyperplastic adenomas of atrophic gastritis
  A Circumscribed polypoid
  B Diffuse
III Heterotopic adenomas
  A Aberrant pancreatic tumors
  B Brunneriomas
IV Benign argentaffinomas
V As much nonepithelial as epithelial
  A Undifferentiated adenomyomas
  B Inflammatory fibroid polyps

SIMPLE ADENOMAS

Simple adenomas are encountered in about 1 0 per cent of patients who receive thorough roentgenologic and endoscopic study of the stomach The general autopsy incidence is about 0 3 per cent Usually the adenomas are limited to the stomach but at times they are part of gastrointestinal polyadenomatosis or of the Peutz Jeghers syndrome Diffuse polyposis of the stomach is very rare but not uncommonly two to four simple adenomas are found per stomach No part of the organ shows special propensity towards adenoma development The individual lesions may be either sessile or pedunculated and their surface appearance may be tense and smooth or crinkled like a partly deflated balloon Most are only a few millimeters in diameter

The majority of simple adenomas cause no clinical illness About three quarters of the patients are men and at the time of diagnosis are in midadult life They are discovered during examination for other lesions The commonest associated disease is atrophic gastritis and this is the basis for the permanent achlorhydria which accompanies most instances of adenomatosis Some simple adenomas come to medical attention because they bleed Anemia secondary to chronic iron deficiency is not rare Prolapse into the duodenum causing partial pyloric obstruction or rarely initiating gastric invagination is an uncommon manifestation This is the only way that adenomas can be responsible for pain

An adenoma is believed to have malignant potentialities Histopathologic interpretation of the benignancy of individual adenomas is

frequently a difficult matter of itself, and there is therefore wide variation in the reported incidence of malignant change Information on the tissue dynamics is necessarily circumstantial even in such a straightforward disease as pernicious anemia because rarely does one have or wish to make the opportunity to observe adenomas over long periods But in medicine as in law circumstantial evidence may be more reliable than the testimony of eye witnesses and it is unquestionably significant that the patient with pernicious anemia is as much as seven times more susceptible to development of both simple adenomas and gastric cancer than the person without pernicious anemia

Gastroscopic examination is by far the best way to detect and identify these lesions It probably entails an error of about 20 per cent due to inability to reach the portion of the stomach concerned In about 40 per cent of the cases roentgenologic study fails to detect abnormality Bubbles and local swellings of the rugae can confuse the picture Except in the patient with pernicious anemia discovery of simple adenomas usually comes as a surprise

Ideally all simple adenomas should be eradicated surgically This appears to be one of the rare clinical situations which permit one to make some sort of concrete contribution towards prophylaxis of gastric cancer In practice other considerations sometimes stay radical therapy but a golden opportunity is lost if the reason for ignoring an adenoma has anything to do with smallness of the lesion or discovery that other disease is responsible for the symptoms of the moment

HYPERPLASTIC ADENOMAS OF ATROPHIC GASTRITIS

In chronic atrophic gastritis the surface and foveolar cells show a tendency to undergo hyperplasia as discussed under the subject of gastritis In addition to great lengthening of the foveolae there may be *stratification of* the epithelium with partial obliteration of foveolar lumina and development of retention cysts within the thickened mucosa The resulting adenomatous growth is much less sharply defined than is a simple adenoma Sessile polyps are often formed but in their vicinity there are likely to be vaguer areas of beaded or granular mucosal thickening Sometimes large areas are involved, transforming portions of the mucosa into warty plaques

This too is believed to be a premalignant process Its danger in this regard cannot be measured at the present time Other than this there appear to be few clinical manifestations Important bleeding is unusual When discrete polyps are formed they may behave mechanically like simple adenomas

This is a diffuse or scattered process Specific therapy necessarily could be complete in some cases only if a total gastrectomy were done Obviously to do this for prophylactic purposes would be a thoroughly impractical approach Localized tumor should be resected The best one can do when a very diffuse process is recognized is to keep the stomach under close periodic scrutiny for changes suggestive of malignant transformation For this both roentgenologic and gastroscopic study are required

ABERRANT PANCREATIC TUMORS

Aberrant pancreatic tumors the most frequent anomaly of the pancreas are found in about 0 5 per cent of routine autopsies About 70 per cent of the patients are men and they are usually between 25 and 55 years of age at the time the lesions come to light Approximately one quarter of the tumors occur in the stomach Although the cardia is occasionally involved about 85 per cent of those that involve the stomach occur in the antrum or pylorus *About 75 per cent lie in* the submucosal position 15 per cent are intramuscular and 10 per cent are subserosal (*Fig 61*) *Whatever the position the tumor is* composed of normal pancreatic acini which join a well developed duct system and this *always empties into the gastric* lumen Even though the acini are separated by muscle bundles or connective tissue there are only

one or two main ducts Most of the tumors are about 1 cm in diameter when discovered Rarely do they exceed a diameter of 5 cm although if they should become cystic as a result of ductal occlusion they may attain a huge size Occasionally more than one lesion may be found per stomach Common gross tumor configurations are conical hemispheric guttate and columnar Some times the tumors develop within diverticula of the distal stomach but they never cause pseudodiverticulum formation

Aberrant pancreatic tumors can be affected by all of the acquired diseases to which the pancreas proper falls heir especially acute pancreatitis carcinoma chronic fibrosis and calcification and islet cell tumor Except for a degree of chronic inflammation however all are very unusual Two other complications may occasionally occur when pancreatic tissue occurs in the stomach—ulceration with bleeding and pyloric obstruction

Except when one of these complications develops there are no subjective manifestations Most come to clinical attention either by chance or because ulceration or pyloric obstruction leads to pain

Occasionally a specific diagnosis can be made without histologic study The characteristic gross feature is the presence of a relatively wide duct extending from the interior of the tumor mass to the surface of the gastric mucosa The roentgenologist can recognize this if it fills with contrast medium (Fig 62) If he cannot both he and the gastroscopist see no more than a relatively small circumscribed submucosal tumor Deeply situated tumors may be detectable only by palpation of the stomach



FIG 61 Aberrant pancreatic tumor in surgical specimen The lesion lies in the submucosa

Treatment is surgical extirpation In many cases the diagnosis will not be suspected at the time of operation

BRUNNERIOMAS

Brunneriomas are usually found in the duodenal bulb where they produce the roentgenologic picture of multiple polyps but at times they occur in the pyloric ring and antrum They take the form of small hemispheric submucosal swellings They have a duct system which empties into the gastric lumen but unlike aberrant pancreas many narrow ducts reach the lumen and none is large enough to imbibe contrast medium for roentgenologic demonstration

OTHER BENIGN EPITHELIAL TUMORS

Argentaffinomas rarely occur in the stomach About one fifth behave as malignant tumors



FIG 62 Aberrant pancreatic tumor of the antral lesser curvature The diagnosis was suggested roentgenologically by detection of the central duct *(arrow)*

Adenomyomas are intramural tumors composed of undifferentiated glandular alveoli surrounded by heavy bands of normal smooth muscle The epithelial elements are probably of native gastric origin There is a well developed ductal system in most cases although the gland cells seem to show little

secretory activity A few instances have been reported however in which large retention cysts have developed Adenomyomas become important clinically if they should cause obstruction at the pylorus or if they should undergo ulceration and hemorrhage There are no specific diagnostic features Treatment is surgical extirpation

Pathologically *inflammatory fibroid polyps* are difficult tumors to classify and although rare they have been described under many names Some are clearly of inflammatory origin A few may be merely polypoid forms of eosinophilic granulomas although there seems also to be a fibromatous element Characteristically in addition to inflammatory cells there are prominent fibroblastic whorls about the tumor s small vessels In some cases the glandular elements are largely destroyed and the lesions have the characteristics of intramural rather than epithelial tumors

CYSTS

Gastric cysts comprise a heterogeneous group and the reason for making a category of them is largely one of convenience They may be classified as follows

I Congenital
  A Enterogenous cysts
  B Dermoid cysts
II Echinococcal (primary secondary)
III Mechanical
  A Traumatic (hematoma)
  B Following corrosive injury
  C Simple mucosal retention cysts
IV Neoplastic
  A Adenomatous cysts (various types)
  B Secondary to central necrosis of nonepithelial tumors
V Others cause undetermined
  A Lining tissues destroyed precluding classification

Most types are secondary to other gastric diseases and are discussed under the primary conditions

Enterogenous cysts arise from heterotopic rests of enteric epithelium The nature of the lining epithelium is paramount for specific identification and gastric small bowel and bronchial epithelium have been described in cysts attached to the stomach All are very rare Well developed gastrogenous cysts may have all the appearances of miniature stomachs They are usually attached to the distal stomach without a luminal interconnection Some lie in the submucosal position but most are extramuscular sharing the muscularis propria Enterogenous cysts have been diagnosed in the neonate and in the very elderly Most have been discovered during early adulthood They cause mechanical troubles by virtue of their bulk and pressure effects Surgical extirpation is ordinarily not a difficult problem

Dermoid cysts commonly come to medical attention because of epigastric pain hemorrhage or their mass They may be found shortly after birth or not until the patient has reached old age Many tissues may be represented in a single cyst

Echinococcal cysts rarely affect the stomach primarily Almost all cases develop through spread from the liver as discussed in the chapter on the liver The malignant alveolar type has not been described in this organ but presumably it could occur

BENIGN NONEPITHELIAL TUMORS

All of the native nonepithelial elements which occur in the gastric wall are capable of undergoing benign neoplasia and sometimes metaplasia is responsible for benign tumors composed of tissue quite foreign to the stomach Compounding of tissue elements within a single lesion often occurs with production of complex histopathologic pictures Benign nonepithelial tumors therefore occur in many histopathologic variations Leiomyomas and neurogenic forms are very common but only an occasional one is big enough to be detected short of special study at autopsy Others are quite rare but once they form they regularly develop to macroscopic size Some types are pathologic curiosities only and will not be discussed osteomas osteochondromas benign reticulo

mas benign histiocytomas benign lymphomas and pure myxomas

Benign nonepithelial gastric tumors become of clinical importance because of their complications and because they often pose difficult diagnostic problems All types may become ulcerated and bleed and sudden hemorrhage is a common manifestation through which they *first come to medical attention Sometimes* an *intact* tumor appears able to cause the dyspepsia of muscular incoordination by creating an irritating focus More definite mechanical problems are those of obstruction of the distal stomach and prolapse into the duodenum Initiation of gastric invagination has been reported It is possible that some of these lesions can undergo malignant change but if so this is a very rare complication

LEIOMYOMAS

It has been demonstrated by detailed sub macroscopic scrutiny of stomachs at autopsy that leiomyomas occur in from 15 to 40 per cent of adult people The incidence of potentially significant gross tumor formation is about 0 2 per cent in the adult population Macroscopic leiomyomas comprise about 1 6 per cent of all gastric tumors There frequently is compounding with other tissue types especially fibroma

The basic tumor *form is a sphere but as* the lesion enlarges coarse lobulation may develop *Pedunculation is common Some*times leiomyomas of the distal antrum and pylorus take the form of an encircling tumorous ring simulating the adult type of hypertrophic pyloric stenosis Deep central ulceration with formation of a pseudodiverticulum is common Occasionally leiomyomas develop within true diverticula About two thirds of the *lesions lie in the submucosal* position enlarging into the gastric lumen and tending to make their presence known relatively early Subserosal leiomyomas may grow into huge exogastric masses before symptoms result About 20 per cent of leiomyomas develop at one of the gastric orifices the rest being scattered at random over the stomach In about 10 per cent of cases more than one leiomyoma are grossly discernible

Patternless dyspepsia is the complaint in about 60 per cent of symptomatic cases sudden hemorrhage in about 20 per cent and an abdominal mass which is recognized by the patient in about 10 per cent In spite of common involvement of the orifices *mechanical complications are relatively un*common *Pyloric* obstruction is produced in only about 4 per cent of cases

NEUROGENIC TUMORS

Histopathologic interpretation and taxonomy have been difficult in this group The great majority arise from the cells of Schwann and schwannoma is the best term for this type There are several histopathologic variations of schwannoma leading to common usage of the synonyms neurilemmoma glioma and neurinoma Most seem to arise in *Auerbach s plexus few in Meissner s These* are common gastric tumors having been reported in 7 per cent of autopsy stomachs submitted to detailed microscopic study Clinically important schwannomas have an incidence about one fifth that of clinically important leiomyomas Compounding with fibrous tissue is common and gastric participation in von Recklinghausen s neurofibromatosis is not unusual

*Schwannomas usually grow in the sub*mucosal position and expand into the gastric *lumen Ulceration and hemorrhage are com*mon often by the time the tumor is no more than a few centimeters in diameter Because their favorite site is the lesser curvature of the pars media pyloric obstruction is rare Transpyloric prolapse has been reported several times Exogastric schwannomas have been reported up to 32 cm in diameter

FIBROMAS

These tumors usually contain compounding elements common histopathologic forms being the neurofibroma myofibroma lipofibroma myxofibroma and adenofibroma Incidence figures are difficult to interpret because *varying classifications are* used and reported Fibromas appear to be less common

than schwannomas Grossly there are no characteristics which might differentiate pure fibromas from leiomyomas Occurrence of more than one tumor per stomach is rare Hemorrhage and pain are the common symptoms

Fibromatous tumors are to be distinguished from diffuse fibromatosis of the stomach This is an idiopathic nonneoplastic process which leads to widespread fibrous replacement of parts or all of the muscularis propria and submucosa It is very rare and its implications are not understood

LIPOMAS

About 6 per cent of benign nonepithelial gastric tumors are lipomas The incidence at autopsy is about 0 03 per cent They are sessile spheres with a tendency towards lobulation and towards deep central ulceration Almost all grow in the submucosal position Pedunculation is rare There seems to be some preference for the antrum Occasionally a very large intragastric size is attained

In about half the cases the first and often the only manifestation is hemorrhage Pyloric obstruction is produced in 20 per cent a much higher incidence than observed with the other tumor types About one of four patients complains of upper abdominal pain In a good many cases no signs of illness develop until the patient has attained advanced age



FIG 63 Leiomyoma of greater curvature of the pars media These four spot films demonstrate the danger of misinterpretation by examining the stomach when it contains too much barium suspension Note the apparent variation in size and configuration of the lesion depending on the amount of pressure used and the rotation of the patient In the lower right film the lesion does not show at all

Lipofibromyxoma angiolipoma and fibrolipoma are occasionally encountered Lipoid tissue is sometimes focally deposited in the mucosa in cases of atrophic gastritis

DIAGNOSIS

Diagnosis of a benign nonepithelial tumor which expands intragastrically is the privilege of both radiologist and gastroscopist It is

important that only small amounts of contrast medium be used during fluoroscopy so that adequate mucosal study can be obtained It is remarkable how easily a large tumor may be overlooked when there is too much barium suspension in the stomach (Fig 63) Detection of the lesion determination of its location and relations estimation of its size detection of the presence of ulceration and estimation of its state of benignancy can usually be accomplished with some accuracy by the combined technics It is clear from the foregoing that there is rarely any gross *characteristic which permits one to guess at* the histopathologic type Often enough even microscopic study leaves the pathologist uncertain Usually a spheroid or roughly spheroid mass is recognized underlying normal appearing mucosa by both radiologist and gastroscopist Rugae mount to the side of the tumor but become flattened out quickly towards the summit Occasionally a leiomyoma or fibroma may become sufficiently calcified to prove radiopaque

Exogastric lesions ordinarily do not cause enough trouble to stimulate diagnostic effort until they are large enough to be palpable Rarely does drag at the site of attachment cause a roentgen detectable deformity of the gastric profile The fact that one is dealing with a gastric tumor is usually discovered only at laparotomy

TREATMENT

Surgical excision should be carried out whenever the patient s general condition permits Local resection is often sufficient for *exogastric tumors and for intragastric ones* situated in the upper half of the stomach Often the surgeon will be uncertain about the exact nature of the lesion and will feel it necessary to proceed more radically

GASTRIC ULCER

Gastric ulcers are different from other upper gastrointestinal ulcers in many respects Etiologically it is not clear at what point their final common pathways might bring gastric and duodenal ulcer together as a single pathologic process but clinically the two are separate diseases Gastric ulcer does not cause as precise a clinical illness as does duodenal ulcer and there is abundant autopsy evidence to show that gastric ulcers are more *likely to remain subclinical throughout their* courses or until a complication supervenes Perhaps it is for this reason that complications seem so much more of a hazard to the gastric ulcer patient It explains too why although gastric ulcers are commoner than duodenal duodenal ulcer patients are commoner than gastric ulcer patients But ulcer disease is a disease of the whole body and the ulcers themselves may break out in more than one place In about 20 per cent of people with gastric ulcer there is one ulcer or more elsewhere in the upper gastrointestinal tract usually the duodenum Many aspects of the general subject of ulcer disease are it is believed best discussed under Duodenal Ulcer to avoid repetition and reference should be made to this other chapter

Gastric ulcer is less restricted in its sex and age distributions than duodenal ulcer Symptomatic ulcers are two to three times as common in men as in women Initial symptoms may develop at any age It is necessary to realize that gastric ulcer is a common disease of the very young and very old as well as of the young adult Considering the fact that the autopsy incidence of gastric ulcer is about 0 5 per cent among infants and children it is astonishing how infrequently clinical observations are reported among the pediatrics age group Approximately half of the gastrointestinal ulcers of neonates occur *in the stomach* Gastric ulcer is being reported more and more frequently as a cause of new disease among elderly people and in this group there appears to be no sex preference

GROSS FORMS

A gastric ulcer is best defined as a focal loss of tissue which extends through the muscularis mucosae into the submucosa Thus mucosal erosions are categorized separately This appears to be an important distinction although there is reason to believe

that locally within the gastric wall there may be some etiologic factors common to both In about 5 per cent of cases there is more than one ulcer per stomach Any portion of the stomach may be involved but the favorite sites are the lesser curvature of the pars media and the walls of the antrum It is important to note that in spite of classical teachings between 5 and 10 per cent of benign gastric ulcers occur precisely on the greater curvature of the pars media or antrum The fundus is infrequently involved but sometimes in cases of hiatus hernia a chronic ulcer develops in the herniated portion of the stomach Hiatus hernia occurs in about 8 per cent of patients with chronic gastric ulcer The ulcer bearing stomach commonly manifests three functional peculiarities which are evident to radiologist and gastroscopist rapid secretion general irritability and a thin spastic band (incisura) about the segment of stomach which contains the ulcer



FIG 64 Benign chronic ulcer of the lesser curvature of the pars media The crater is deep extending far beyond the gastric profile Opposite it the greater curvature presents a deep incisura Overlying the stomach is the gas filled splenic flexure of the colon

There are two main types of benign gastric ulcer and they have certain clinical and pathologic characteristics of their own The *acute ulcer* develops rapidly as a relatively small but deep crater with sharp edges and considerable peripheral reaction Almost never does the diameter exceed one centimeter Crater depth is accentuated by surrounding edema Endoscopically a rim of hyperemia is regularly found around the crater but this will have disappeared by the time the specimen is examined by the pathologist Quick perforation of the gastric wall rather often occurs Healing however may proceed very quickly too

Chronic gastric ulcer is the familiar Cruveilhier ulcer (Fig 64) It has the appearance of chronicity being discrete and

regular in outline and showing no elevation or peripheral reaction in the surrounding mucosa In outline it is circular or ovoid The base is gray yellow during life but often it is covered by exudate and debris The crater floor may be quite lumpy Its depth better measured roentgenologically than from the pathologic specimen is usually considerably less than its diameter A chronic ulcer may be 10 cm in diameter at the time it is first discovered but the majority measure between 1 and 3 cm

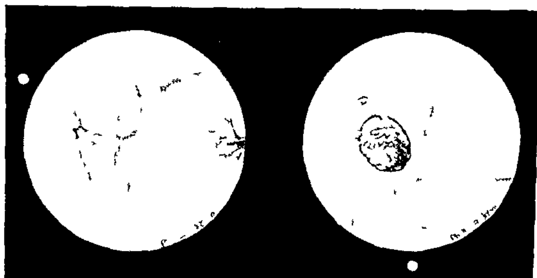


Fig 65 Gastroscopic views of two chronic gastric ulcers On the left there is a healing scarred ulcer on the angulus close to the lesser curvature The pylorus is seen beyond The picture on the right shows an active ulcer precisely on the greater curvature of the pars media

CUSHING AND CURLING ULCERS

The stomach is a common site for ulcers secondary to organic brain disease (Cushing ulcer) and to extensive skin burns (Curling ulcer) These forms of injury have already been discussed in regard to the esophagus It is thought that stimulation of the parasympathetic center in the diencephalon by either an expanding lesion or injury results in autonomic imbalance and this may lead to local mucosal ischemia and ulcer formation The integrating factor following the stress of a burn can surely be assumed to be humoral under the influence of the pituitary adrenal axis It is well accepted that the alarm reaction of Selye s general adaptation syndrome plays an important role here

These ulcers are always acute and they demonstrate special propensities to hemorrhage and to perforate

CLINICAL MANIFESTATIONS

It is not clear why only a portion of gastric ulcers make people feel sick but this is such a common type of phenomenon in medicine that one must assume it to be the patient rather than the lesion which controls clinical overtness It is only happenstance when an ulcer is found in an asymptomatic person so the incidence of occult ulcers is not known Of the patients who seek medical help about one third do so because of an ulcer complication and two thirds because of simple ulcer symptoms Ulcers cause symptoms largely because they alter the muscular activities of the upper gastrointestinal tract In order that there be nausea for instance the proximal part of the duodenum or the distal stomach must be distended against resistance and the ulcer crater itself acts only as the trigger mechanism for this Similarly it is believed that ulcer pain comes not from the crater but from secondary segmental muscle spasm

or from some other type of reflex dyskinesia

The patient with symptomatic acute gastric ulcer ordinarily gives a brief history with a fairly sudden onset Epigastric pain of the hunger periods with food relief is not very common More often the complaints are less definite with patternless pain nausea vomiting and many new food intolerances Sudden hemorrhage is a common initial manifestation The symptomatic picture in children with acute gastric ulcer is very vague indeed and if it should lead to roentgenologic examination discovery of an ulcer almost always comes as a surprise

Symptomatic chronic ulcers rather often produce hunger pain with food relief Just as often the pain is not this distinct and instead the patient has difficulty in telling what parts of the day are most troublesome for him Night pain is not particularly striking In most cases however the pain is epigastric and is felt close to the center of the body Rarely is there radiation unless there has been penetration although pyrosis is so common that the patient is likely to tell of epigastric pain which rises through his chest to his throat Periods of nausea and vomiting are prominent especially at the time of exacerbations In children all of these manifestations are unpredictable and patternless but periodic vomiting is perhaps the commonest

The patient with chronic ulcer may give a history which covers many many years In at least half the cases there will have been a weight loss of 10 lb or more About a quarter of the patients will have lost at least 20 lb some rather quickly This requires emphasis because one must not place much emphasis on a history of weight loss in distinguishing between gastric ulcer and cancer

Physical examination of the ulcer patient reveals a paucity of local signs Tenderness is usually found but sometimes is not even when an active ulcer is known to be present

COMPLICATIONS

Lesion for lesion gastric ulcer is much more likely to become complicated than duodenal ulcer Acute ulcers usually prove important only because of their complications and the frequency of hemorrhage and perforation among the gastric ulcers of neonates and children seems especially impressive Perhaps this is because uncomplicated ulcers often pass unnoticed in the pediatrics age group Posterior wall ulcers seem less prone to both hemorrhage and perforation

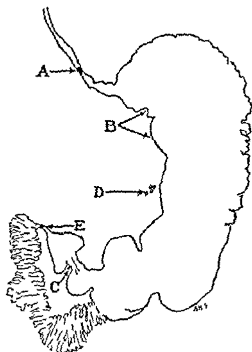


FIG 66 Some of the many pitfalls to watch for during stomach fluoroscopy and examination of films *A* Rather frequently a small collection of barium remains here in the esophagus following passage of the bolus Not to be confused with esophageal ulcer or other abnormality *B* Notches smooth bulges and crater like deformities are frequently seen on the normal lesser curvature profile in this region They are caused by the twisting of rugae away from the lesser curvature Ulcer is frequently simulated *C* A small triangular projection from the middle of the greater curvature aspect of the partly closed pylorus is a normal finding in some people It is produced by the fan shaped muscle of Cole Ulcer is superficially suggested *D* Calcification in the pancreas is sometimes confined to its retrogastric portion and may not be demonstrated on films unless proper rotation is used *E* Postbulbar ulcers sometimes cause only minor deformity Examination of the duodenum does not end at the bulb

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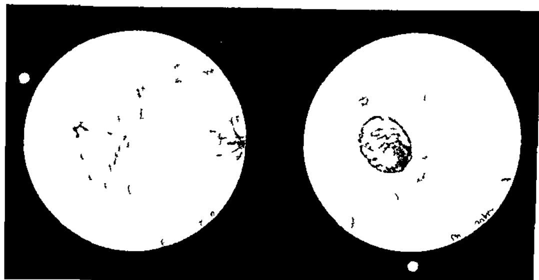


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secretion hyperactive gastric motility and the presence of an incisura The gastroscopist must be sure he has scrutinized as much of the stomach as can be reached endoscopically in order that a second or third ulcer not be overlooked Although both examination methods are useful for observing the process of healing the lesion is still detectable endoscopically after the radiologic picture has returned to normal appearing as a smooth depression which turns from gray to orange with epithelialization Complete healing leaves a mucosa which is normal but underlying scar may have caused contraction In cases in which the ulcer has involved the distal lesser curvature the final roentgenologic sign is cicatricial shortening of the lesser curvature with elevation of the pylorus and the gastroscopist may find a notch like contraction deformity of the profile of the angulus (*Henning s sign*)





FIG 67 Benign chronic ulcer on lesser curvature of the pars media The film on the left shows a large crater with prominent radiating folds The film on the right was made only 21 days later following medical management It is considered normal

TREATMENT

The great majority of gastric ulcers should be treated medically methods are discussed under Duodenal Ulcer The majority of chronic ulcers require approximately four weeks of therapy before the roentgenologic picture returns to normal and about six weeks for return to gastroscopic normalcy It is remarkable how quickly some very large ulcers disappear (Fig 67) Acute ulcers may heal completely in a week Some chronic ulcers —perhaps 3 per cent—continue to remain

than those of the curvatures and anterior wall As will be pointed out a little later carcinomatous degeneration is not—or almost not—a complication of benign gastric ulcer

Hemorrhage is the major problem It is about twice as common as perforation Perhaps 25 per cent of patients with symptomatic ulcer first seek help because of hemorrhage and at least 35 per cent have experienced one or more important bleeding episodes Once a gastric ulcer begins to bleed it is less likely to stop spontaneously than is a duodenal ulcer The risk of fatal exsanguination is about twice as great in the former For purposes of gastroscopic differentiation *it is important to note that gastric ulcers bleed from their center while ulcerated carcinomas bleed from their edges*

The two terms perforation and penetration should not be used loosely The former means the sudden opening of an ulcer through the peritoneum resulting in free or only partly restricted soilage of the peritoneal cavity Penetration merely indicates the boring of an ulcer through tissues without opening into any other cavity Perforation of gastric ulcers is responsible for a significant portion of acute abdominal catastrophes Acute ulcers and Cushing ulcers are particularly prone to develop quickly and open suddenly through the peritoneum Chronic ulcers often perforate too but they are more likely to penetrate because their slower development permits peritoneal reactivity to establish adhesions with other organs or tissues Most perforations occur through the anterior wall of the antrum the lesser curvature of the antrum and the lower half of the pars media s lesser curvature It may be very difficult for the surgeon who repairs a perforation to state with assurance whether the lesion is antral or duodenal because of variabilities in the course of the pyloric vein Only about one per cent of all ulcer perforations open into the lesser peritoneal sac It is to be noted that about two thirds of these are secondary to gastric ulcers the others being due to posterior ulcers at the base of the duodenal bulb

Penetrating ulcers sometimes bore into the mesentery the balled up omentum retroperitoneal structures and elsewhere but the commonest organs to become involved are the pancreas and liver Usually posterior penetration into the pancreas is recognizable clinically because pain gets much worse it loses its previous pattern and becomes almost continuous it radiates distinctly through to the back and it becomes associated with marked anorexia This is a serious complication because of the disabling pain it creates and because of frequent inability of the tissues to heal spontaneously Penetration into the liver is not attended by such a striking change in the picture Penetrations which involve the mesenteries and bowel sometimes go on to perforate into the bowel lumen producing a gastrojejunal or gastrocolic fistula This is a rare complication

Approximately 15 per cent of chronic gastric ulcers cause pyloric obstruction Often this is due simply to edema and spasm and responds quickly to simple gastric aspiration and rest Cicatricial obstruction is a slowly developing process sometimes leading to great chronic gastric dilatation before vomiting or other new symptom is added to the ulcer picture

DIAGNOSIS

Diagnosis is the combined responsibility of radiologist and gastroscopist Sometimes only the former can find the lesion and sometimes only the latter In children total reliance must be placed on the x ray examination because gastroscopy is rarely performed on patients younger than 12 years old The history and physical examination can do no more than raise the possibility of gastric ulcer Gastric analysis is of no help Gastric secretory power is ordinarily depressed and it is to be expected that temporary achlorhydria will be encountered in approximately 10 per cent of patients with benign gastric ulcer

In addition to the appearance of the crater itself which is described at the end of this chapter the examiner is alert for the accessory signs of ulcer activity excessive gastric

pyloric ulcer In spite of these problems radiologic diagnosis is more accurate than surgical diagnosis (Fig 68) The great majority of ulcerated lesions within the pyloric canal are benign this being a relatively unusual site for gastric carcinoma

The clinical picture which accompanies pyloric ulcer is characterized by spastic manifestations which cause considerable pain and these usually drive the patient to the doctor earlier than do the symptoms of other gastric ulcers Often there is no rhythmicity or periodicity to the complaints In addition to patternless pain it is usual for gas fullness and periodic nausea to be prominent in the symptomatology The important complication is cicatricial pyloric obstruction and this is common Weight loss sometimes of great degree almost always develops

Pyloric ulcers respond poorly to medical treatment whatever form may be administered The tendency towards recurrence is very great With each recurrence there is an additional problem with gastric emptying Experience with medical treatment has been discouraging enough to warrant the advice that surgical treatment be considered as soon as the diagnosis has been established Both subtotal gastrectomy and vagotomy and gastroenterostomy are satisfactory procedures

PERIANTRITIS

This is a most enigmatic condition or conditions Deformities of the antrum create particular diagnostic concern and in fact this is the region that causes most of the interpretational problems which both the roentgenologist and gastroscopist must face Often patients with various types of dyspepsia are found to have antral irregularity on x ray examination even though the mucosa itself appears normal or almost so The deformity *may be static and if peristalsis stops short* of the antrum the diagnosis of cancer may seem assured In these cases the gastroscopist is seldom as convinced of tumor in the area as is the roentgenologist To him the antrum may appear rather narrow but it is not fixed and insufflation of air causes a change in configuration Sometimes the mucosa is pitted by small scars and low crescentic folds caused by periantral contractions may infringe on the antral lumen here and there

*One of two conditions is ordinarily re*sponsible for this general picture The deformity may in some patients be largely of spastic origin and in them a localized inflammatory reaction presumably responsible for spastic antral reflex can be found somewhere in the abdomen In other cases the deformity is due to residuals of occult inflammatory reaction in the antral wall itself such as one could rightly ascribe to ulcer healing In a portion of patients who can be studied over long periods it is possible to watch recurrent crops of small antral ulcers develop and clear from time to time Presumably the submucosal scars stiffening and mural irregularity which are recognizable in the antrum are explained by healing of such ulcers Histopathologically the submucosa shows an excess of diffuse and aggregated round cells and there are prominent bands of fibrous tissue throughout the antral wall The muscularis propria is partly replaced by fibrosis in a spotty or diffuse manner The mucosa itself ordinarily is little altered

There is no question that both chronic functional antral spasticity and this type of fibrous periantritis can be the cause of symptoms The pattern of complaints is most variable from patient to patient Most symptoms are reminiscent of classical ulcer complaints but often there is no regularity to their rhythm Bleeding is an uncommon complication and rarely is obstruction produced Treatment must be a strictly individualized matter No general rules can be formulated Occasionally subtotal gastrectomy may be justified by the severity and persistence of symptoms

CARCINOMA

PHILOSOPHY OF THE GASTRIC CANCER PROBLEM AS IT STANDS TODAY

Gastric cancer is the most dismal of gastroenterologic diseases Its ubiquity its premetastatic silence its clinical simulation of many

active as judged by objective study for many months or even two or three years Meanwhile all subjective manifestations may clear and the patient may consider himself well It is not clear why this small group should behave differently but there is probably some relationship to the amount of fibrous tissue which has been deposited about the ulcer base

cussed later and revolve largely about certain complications

PYLORIC ULCER

Ulcers of the pyloric canal which comprise about 2 per cent of all chronic gastroduodenal ulcers have some unique clinical characteristics and frequently raise diagnostic problems Precise identification of a lesion s

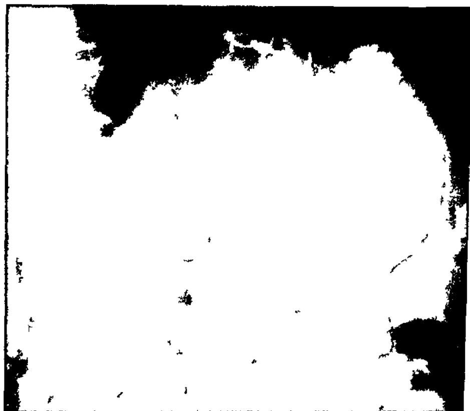


FIG 68 Huge pyloric ulcer In spite of the remarkable size of the lesion there was no obstructive feature

Subtotal gastrectomy partial resection with vagotomy and local wedge resection are procedures which are often recommended for treating uncomplicated gastric ulcer They should not often be employed because they are not necessary and because the risk of postoperative grief is far greater than the clinical problems created by most ulcers The indications for surgical treatment can only be thought of in very general terms because it is so important to individualize patients with gastric ulcer In general they are the same as for duodenal ulcer as will be dis

site of origin in this area may be very difficult for both roentgenologist and surgeon and the gastroscopist cannot see pyloric canal ulcers at all They are not only difficult to find by x ray examination but the normal canal is notorious for false niches especially those produced by the fan shaped pyloric muscle of Cole Frequently when the normal pylorus is contracted a small triangular pocket is found extending from its greater curvature aspect (Fig 66) The smoothness of the defect and its disappearance when the pylorus relaxes help distinguish it from a

for cancer is now about 15 per cent and for total gastrectomy about 30 per cent The risk of the operation remains important enough to warrant a demand for positive results and yet the operative mortality rate still exceeds by far any conceivable cure rate

In these connections it is particularly important to avoid the many traps which are inherent in gastric cancer statistics traps which have been multiplied by introduction of the machine records technic for dealing with medical data This technic forces mechanization on data which are not mechanizable and replaces small accurate figures with big inaccurate ones The machine records machine does not often get a chance to deal with the truth Push button statistics cannot distinguish between the patient with a questionable diagnosis of cancer and the one with a huge fungating tumor all the cards fall out together when the button is pushed It must be remembered that the histopathologic diagnosis of gastric carcinoma may be very difficult even when the whole stomach is available for study Professional cancerphobia is such that if there is suspicion of cancer the case usually is listed as cancer on the assumption that it is always best to record the most serious diagnosis Other laboratory factors adding to the confusion are the habit of some pathologists to classify simple adenomas as Grade I carcinoma and of others to make their diagnoses on the basis of frozen section alone The greatest confusion of all is created by failure to distinguish carefully between the terms operability resectability palliation survival and cure When inspecting reports on success in the treatment of gastric carcinoma it is most important that the use of these terms be noted carefully It is easy to misinterpret survival rates among selected patients as cure rates for the disease as a whole A dangerous delusion is created by some figures unless it is understood that certain criteria for calculating survival rates eliminate several classes of dead patients from consideration

All in all there have been no important contributions towards the gastric cancer problem in many many years It can freely be admitted that we are not doing very well with the problem Our focus has been too narrow too unimaginative No answer can even be suggested at this time except that obviously a technic probably serologic must be found for regularly establishing the diagnosis during the prepatent period and that a therapeutic agent probably chemical must be developed for eradicating metastases simultaneously with the primary lesion It seems clear that we should give up current measures directed at cure as a bad job now without waiting for a more effective replacement A degree of emotional and physical comfort is all that can be promised the patient at the moment It is not much but it at least represents the retreat from the current blind track which is necessary before the right track can be found The doctor should consider well his responsibility to avoid being frightened into unleashing the whole pack of therapeutic hounds against the cancer as the way out for himself but not necessarily his patient

INCIDENCE AND SUSCEPTIBILITY

This is said to be the most common cancer of men The National Office of Vital Statistics reported that 23 683 people in the United States died of carcinoma of the stomach in 1951 and possibly there were 10 000 more among deaths recorded as due to unspecified hepatic neoplasms gastric ulcer and other unspecified gastrointestinal diseases This represents approximately 20 per cent of cancer deaths Men predominate over women in a ratio of about 3 5 to 1 The frequency of gastric cancer among close relatives of gastric cancer patients is about four times as great as that among the population in general People with blood group A appear to be especially susceptible to the tumor The patient is most often in the sixth or seventh decade of life at the time the diagnosis is made (Table 6) It is not excessively uncommon to encounter the disease in the early third decade or in the ninth but in general this is a disease of middle life In addition to rather clear-cut evidence of hereditary influences it is possible

less important diseases its difficult identification once detected and its efficient defiance of therapy make it a hopeless disease in almost all cases We are told that it is wrong to think of gastric cancer as hopeless because this might discourage progress along current lines of managing it The fact is that we have gone about as far as is possible along current lines—clinical examination of the patient who presents himself when symptoms drive him to do so roentgenologic and gastroscopic and cytologic examination for diagnosis and surgical extirpation for treatment There is nothing about the current approach to warrant hope that it may become more successful in the future than it is at present We probably have gone too far because our relentless *cancer panic leads to surgical removal* of stomachs that have no cancer to mutilating operations on cancer patients who cannot be cured or even helped by operation and through inevitable operative mortality to the shortening of the lives of some patients treated in all good faith This good faith has elements of superrighteousness and thoughtlessness at times born out of the unfortunate attitudes that we must give the cancer patient everything we have to offer that removal *of the cancerous stomach* offers the patient his only chance and that until better technics are devised we must push current methods as far as we can Too often the patient is not a victim of his disease but of a philosophy There is serious question whether most patients with cancer of the stomach are helped more than they are hurt when current methods are utilized in an effort to cure them

One of the two main problems of gastric cancer today is that no solution to tardy treatment can as yet be found in earlier diagnosis There is Macdonald s paradox of biologic predeterminism which is a way of saying that because the growth and metastatic potentials are inherent in the cancer curability *is not controlled by the ability of the diagnostician or the skill of the surgeon* It has been found by most observers that resectability and curability of gastric cancer improve in proportion to the length of the symptomatic period which has elapsed prior to surgical treatment The tumor which is so potent that it quickly draws attention to itself kills quickly no matter how soon therapeutic gestures are made It has been adequately demonstrated that gastric cancer whether torpid or *puissant is for practical purposes not still* curable by the time it first becomes subjectively recognizable but the question arises as to whether if a technic is found to permit very early diagnosis the patient not believing himself to be sick would submit to a major operation The attitude expressed by most patients If the engine is running all right don t fix it has been the biggest stumbling block to efforts to find and cure early unsuspected gastric cancers through *routine roentgenologic surveys of apparently* healthy people About half of the people found by various observers to have unsuspected cancer have refused operation

The second problem is that the surgical approach is much too limited in its anatomic reachings to eradicate the tumor which is present More radical local operations cannot supply the answer because surgical technics do not delineate between tumor and healthy tissue An inherently selective therapeutic *approach must be found* so that tumor can be destroyed wherever it may be Even though there may not be enough vision at present to make a start one seems justified in insisting now on a raising of therapeutic sights The over all five year postdiagnosis survival (not cure) rate for gastric cancer which is treated surgically whenever possible is now about 5 per cent (patients treated from 1946 to 1950) Recurrence of tumor 15 or 20 years after gastrectomy is no longer found to be rare The five year postdiagnosis survival rate for gastric cancer which is not treated surgically is about 1 per cent Without surgery from 10 to 15 per cent of patients survive five years or more after the onset of bona fide cancer symptoms In most reported series it cannot be shown that surgical treatment either influenced the survival rate or increased the comfort of the patients The immediate surgical mortality rate for subtotal gastrectomy

compounded with foreign elements Thus chorioepithelioma has been reported mixed in with gastric adenocarcinoma *Adenoacanthomas* of the stomach are rare carcinomas representing a mixture of glandular and squamous cell elements They occur mostly in the antrum and pylorus Their metastases sometimes consist only of squamous cell pearls A few cases of pure *squamous cell* carcinoma have been reported from the stomach *Argentaffinomas* (carcinoids) are rare in the stomach in spite of the presence of native argentaffin cells and only about 20 per cent act as malignant tumors They are composed of sheets and cords of epithelial cells which contain chromaffin granules and the granules are able to reduce silver stains

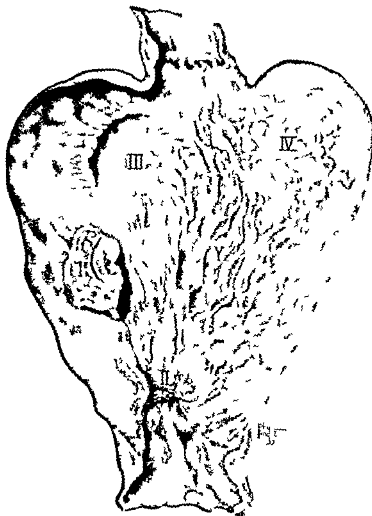


Fig 69 The five gross forms of gastric carcinoma (see text)

Efforts to judge the degree of clinical malignancy from histopathologic examination of gastric carcinomas have proved most frustrating The Broders and similar classifications have been convenient for the pathologist but not particularly useful for the clinician There is much going on between a gastric cancer and its host that cannot be seen with the microscope

GROSS PATHOLOGY

The gastroenterologist must be an untiring student of gross tumor forms because this is largely the basis for his roentgenologic and

that there are racial or environmental influences An especially high incidence has been reported among the Japanese Norwegians and Icelanders although convincing statistical evidence is lacking In this country there is no difference in susceptibility between Caucasians and Negroes

PRECANCEROUS LESIONS

It is probable that carcinoma almost never develops in a perfectly healthy gastric mucosa In all likelihood a number of changes must occur in a number of mucosal cells over a fairly long period before cancer can result The changes which can be labeled precancerous are probably not reversible although there is no need to think of them as invariably leading to cancer At any rate there is evidence to suggest that the prepatent period extends over several or many years and if this is really true it is the most encouraging feature of the tumor s life history suggesting a weak point for possible eventual control The common morphologic denominator among the suspected precancerous lesions seems to be atrophic gastritis and the hyperplastic process which may become superimposed upon it Histopathologic interpretations of the actual malignant change are unfortunately very difficult Hyperplastic adenomas are probably premalignant lesions but they are hardly common enough to account for more than a small portion of gastric cancers Circumscribed areas of hyperplasia in atrophic gastritis appear to be common enough although by the time cancer develops evidence of the precursor is destroyed It must be viewed as significant that about two thirds of gastric cancer patients have the persistent achlorhydria of generalized atrophic gastritis by the time the cancer is first recognized In spite of all the controversy it seems fair to state that benign gastric ulcers never become malignant or almost never do

Pernicious anemia appears to be the only systemic disease which through its gastritis predisposes to gastric carcinoma It is important to note parenthetically that rarely gastric cancer of itself may cause megaloblastic anemia By the time of death from 3 to 10 per cent of pernicious anemia patients are said to have gastric cancer The same predilection for males is found but the age at onset is somewhat more advanced than it is among patients without pernicious anemia The interval between diagnosis of the two diseases in various reported series has averaged six to eight years Rather frequently multicentric primary carcinomas develop in one stomach an observation which adds confirmation to the concept that the premalignant change is widespread hyperplasia superimposed on the generalized atrophic process Because of this special frailty of the pernicious anemia patient he proves to be a particularly advantageous subject for early detection of gastric cancer through periodic clinical roentgenologic gastroscopic and cytologic study

HISTOPATHOLOGY

The many histopathologic classifications which have been offered attest to the frequency of interforms among the more clear cut histopathologic types Specific microscopic classification of every tumor is not possible and in fact it may be very difficult to decide from the histopathologic picture whether a gastric lesion is of carcinomatous nature

These are adenocarcinomas and most are simple (*medullary*) ones composed largely of altered gland cells with little connective tissue They begin rather deep in the gland Eventually they may assume several gross forms About 3 per cent of gastric carcinomas are adenocarcinomas composed largely of mucus producing cells (*colloid*) and these presumably arise from the foveolae or surface cells Some tumors of either origin grow with the production of very few epithelial cells but great overgrowth of hard fibrous tissue (*scirrhous*) These are infiltrating tumors and because of the scanty evidence of cellular activity they have sometimes been recorded as benign gastric fibrosis benign linitis plastica etc

Infrequently other histopathologic types occur and sometimes adenocarcinoma is

appears in most series as the most common (Table 2) It is least restricted in its spread but does not necessarily grow fastest It is responsible for almost all cases of linitis plastica (Brinton's disease) and for most scirrhous tumors All Type I carcinomas are highly cellular Types II and III fall between the other two Superficial spreading carcinoma remains within the mucosa as it begins to grow laterally In most cases it appears to be merely a very early stage of Type IV

Carcinoma may affect any part of the stomach There are no sites of special predilection except when there is pernicious anemia and then most cancers develop in the upper third of the organ Ordinarily about 50 per cent arise in the pylorus or antrum and many of the rest choose the pars media The lesser curvature of the pars media is more often involved than the greater This is further discussed under Diagnostic Errors

TABLE 2 INFLUENCE OF GROSS CARCINOMA FORM ON SURVIVAL FROM THE ONSET OF SYMPTOMS REGARDLESS OF FORM OF TREATMENT (PATIENTS DYING DURING POSTOPERATIVE PERIOD EXCLUDED)

	Borrmann type			
	I	II	III	IV
No patients	8	45	40	64
% alive at end of 6 mos	75	64	68	69
12 "	50	33	35	44
18 "	25	16	22	27
24 "	12	13	15	19
48 "	0	7	3	11

SYMPTOMATIC PICTURE

It is probable as pointed out above that gastric cancers are under development for several or many years before they begin to cause symptoms Often enough the primary tumor remains silent throughout the course of the disease and illness is evident only because of metastatic lesions When symptoms do appear gastric cancer may act like an acute or even fulminating disease or it may remain so benign that the patient is hardly conscious of its location In considering the symptomatic picture therefore one must recall that in all cases symptoms develop late in the disease and in some patients stomach symptoms never appear at all This is only part of the clinician's problem because when gastric symptoms do develop they may take a variety of forms (Table 3) The great spectrum of subjective manifestations is perhaps the most typical feature of carcinoma

TABLE 3 THE SINGLE MAIN SYMPTOM WHICH LED TO THE INITIAL MEDICAL CONSULTATION 200 PATIENTS WITH GASTRIC CARCINOMA

	No of patients
Stomach symptoms	
Epigastric pain	37
Complex dyspepsia	36
Ulcer like symptoms	15
Simple anorexia	14
Simple vomiting	10
Sudden hematemesis	10
Dysphagia	10
Simple belching	7
Simple nausea	1
General symptoms	
Weight loss	8
Weakness	8
Colon symptoms	
Constipation	5
Diarrhea	3
Hypogastric cramps	2
Liver and biliary symptoms	
Right upper quadrant pain	4
Jaundice	2
Other abdominal symptoms	
Variable abdominal pain	7
Abdominal swelling	4
Left upper quadrant pain	1
Discovery of lump	1
Acute gastrointestinal upset	1
Chest symptoms	
Chest pain	[illegible]
Chronic cough	2
Hiccup	2
Pleuritic pain	1
Others	
Study for anemia discovered at blood bank	2
Menorrhagia	2
Back pain	2
Discovery of umbilical lump	1

endoscopic diagnoses It was at one time thought that the configuration of a gastric cancer gives a hint as to its malignant potentialities but expanding experience from many clinics indicates that clinical behavior of a tumor is *not reflected in the macroscopic* form any more than it is in the microscopic assist prognostication It is simple enough to be functional and rare is the tumor that cannot be classified easily (Fig 69)

Type I Sharply limited polypoid carcinoma

Type II Sharply limited ulcer surrounded by an elevated wall



FIG 70 Extensive Borrmann Type IV carcinoma which involves most of stomach A huge ulcer has developed on the lesser curvature

(Table 2) Similarly the site of a carcinoma within the stomach has little bearing on the prognosis of the disease even though a tumor at one of the gastric orifices may call attention to itself long before one growing in the pars media

The Borrmann classification of gastric carcinoma forms has proved useful for diagnostic intercourse among endoscopist roentgenologist and pathologist even though it does not

Type III Ulcer partly surrounded by wall but blending diffusely at some point with the surrounding wall

Type IV Diffusely infiltrating without sharp limit anywhere

Y *To these forms must be added* the superficial spreading type of carcinoma which was not covered by Borrmann

The forms are self explanatory Type IV

time symptoms first lead to medical consulta tion Less frequently there is tenderness As a rule signs of chronic illness are much more evident to the doctor than to the patient Finding that he has lost weight often comes as a surprise to the cancer patient Hepato megaly a moderately common finding does not always indicate hepatic metastases but if a hepatic friction rub is present metastasis is assured

There are some specific findings which al though relatively uncommon are helpful in suggesting gastric or other abdominal cancer *Virchow s (Ewald s Troisier s) nodes* are left supraclavicular nodes enlarged by metastatic growth which has reached them via the thoracic duct Cancer of the lungs and the esophagus commonly metastasizes to either or both supraclavicular areas Abdominal cancers almost always choose the left and the stomach is by far the commonest source *Irish nodes* refer to metastatic enlargement of high left subpectoral nodes (Fig 71) They have the same significance as Virchow s nodes except that they point more specifically to the stomach as the source Detailed palpa tion under the edge of the left pectoralis major muscle is necessary if this sign is to be detected *Blumer s shelf* is the rectal shelf produced by infiltration of Douglas pouch in the female or the rectovesical pouch in the male with tumor which has gravitated to it by free peritoneal implantation It is not at all specific for carcinoma of the stomach but it is a sign of great importance in judging spread of a recognized tumor It present it can be recognized easily upon rectal exami nation provided the finger is inserted deeply enough *Acanthosis nigricans* is a peculiar pig mented papillary skin growth which in a pa tient past 45 years of age comes close to being a pathognomonic sign of abdominal ma lignancy usually of the stomach

METASTASIS AND EXTENSION

The rapidity and direction of spread of gastric carcinoma beyond the stomach are remarkably unpredictable matters The loca tion of the primary lesion its histopathologic features its size and its apparent rate of growth give no information on which to judge the probability of extragastric spread The two main means of spread are by growth along the lymphatics and by direct extension through the gastric wall Free hematogenous metastasis and free peritoneal implantation account for fewer extragastric manifestations The latter accounts for Blumer s shelf and the Krukenberg tumor of the ovary In Table 5 are listed representative experiences with

TABLE 5 METASTASES FROM CARCINOMA OF THE STOMACH AUTOPSY STUDIES

	H lt R d s n s (00 cas s)	H lll (1) (696 es)	Comb d cr
Without spread	7	173	20
With local invasion	160	312	52
With metastasis	180	452	70
Regional nodes	137	385	58
Liver*	130	293	47
Esophagus*	37	—	19
Lungs	43	116	18
Pancreas*	50	95	16
Colon	27	—	14
Gallbladder*	10	—	5
Uterus	10	—	5
Vagina	6	—	3
Adrenals*	30	32	0 7
Ovary (Krukenberg)*	7	48	0 6
Bone	8	38	0 5
Kidneys	20	12	0 4
Spleen*	7	29	0 4
Skin	3	36	0 4
Small bowel*	23	1	0 3
Pericardium	2	7	0 1
Myocardium	2	6	
Thyroid	0	6	
Meninges	1	4	
Brain	3	3	
Thoracic duct	4	1	
Rectum	3	—	
Spinal cord	1	1	
Prostate	1	—	
Testi le	0	1	
Parotid	0	1	

* Includes metastasis and/or direct extension

frequencies of secondary organ involvement Most patients who die before spread occurs die either of unrelated disease or of a cata strophic complication of the primary tumor—



FIG 71 Irish nodes of huge size It was not until biopsy specimens had been examined that carcinoma of the stomach was suspected

of the stomach In only a portion of patients do they point to the stomach In few cases do they suggest the diagnosis b fore the course of illness is well spent If early diagnosis is to be made one must not expect to hear from the patient the symptoms of malignant disease or symptoms with a clearly organic pattern

PHYSICAL FINDINGS

In about one third of the patients initial physical examination fails to reveal any significant abnormality (Table 4) Some of the positive findings are due to the lesion itself some to the general malignant nature of the disease and some to metastatic lesions A mass in the stomach area *can be found in* about one quarter of the patients by the

TABLE 4 SIGNIFICANT FINDINGS UPON INITIAL PHYSICAL EXAMINATION 200 PATIENTS WITH GASTRIC CARCINOMA

	No of patients
None normal examination	71
Mass in upper abdomen	49
Weight loss evident	39
Anemia	25
Tenderness in epigastrium	25
Hepatomegaly	23
Hepatic rub	13
Presence of Irish node	10
Presence of Virchow s node	9
Jaundice	8
Ascites	7
Presence of Blumer s shelf	7
Presence of umbilical metastasis	1
Acanthosis nigricans	1
Pericardial rub	1
Pleuritic rub	1

times hold the lumen open Alkalosis and hypochloremia are unusual results of persistent vomiting secondary to obstructing carcinoma because of the frequency of achlorhydria *Obstruction of some degree at the cardia* or lower esophagus has already developed in about 5 per cent of cases by the time medical help is requested

Approximately 6 per cent of gastric carcinomas perforate acutely This is a complication almost exclusively of men With few exceptions it is the Borrmann Type II which does so and the complication can be expected in about 15 per cent of patients whose tumor assumes this form Most of the lesions are situated in the antrum or along the lower half of the lesser curvature of the pars media The patients present the usual signs of acute abdominal catastrophe in most cases Sometimes *the perforation although acute breaks into* the lesser sac and leads to more limited soilage

Type II carcinomas sometimes become deeply excavated penetrating into neighboring organs with the formation of fistulous tracts Gastrohepatic gastroenteric and gastrocolic fistulas occasionally result Next to esophagogastrostomy gastric carcinoma is the commonest cause of gastropleural fistula

Sudden significant hemorrhage is a complication in only about 5 per cent of cases sometimes as the first manifestation of the illness Carcinoma of the stomach then appears far down on the list of diseases which may be responsible for massive upper gastrointestinal hemorrhage On the other hand *except in cases of carcinoma at the pylorus* chronic blood loss and hypochromic anemia *are very common Occasionally megaloblastic* anemia develops

TREATMENT

Thoughts on treatment have already been expressed in the introduction to this section It is believed that efforts to cure carcinoma of the stomach by surgical extirpation in this era result in more harm than good to the great majority of patients Radiation therapy and presently available chemotherapeutic agents are ineffective

There is much *that can be done to add to* the happiness and detract from the misery of *the patient with incurable disease including* carcinoma of the stomach Although this is not the place for a treatise on this subject it must be mentioned that the purposes of morality of honesty of kindness and of practical realism are best served in almost all cases if the diagnosis and prognosis are discussed in detail with the patient and his family If the doctor is to be of any use to his patient he must not force himself into the role of a constantly sparring opponent

Nonoperative measures are impotent against the complications of gastric cancer Surgical *help is required for relief of pyloric obstruction* for control of the unusual case of severe *hemorrhage and for whatever help is possible* in cases of acute perforation In each of these situations the technical problems facing the surgeon may be very difficult if the proximal portion of the stomach is not free of tumor

THE SARCOMAS

From 1 to 2 per cent of malignant gastric tumors are sarcomas About 0 5 per cent of all sarcomas are primary in the stomach Secondary gastric involvement by multicentric sarcomas is considerably more common than this There are many histopathologic types and *considering their frequencies pathologic* manifestations and responses to therapy this must be considered a notably heterogeneous group of tumors Both clinical diagnosis and histopathologic interpretation are often very difficult

A histopathologic listing of gastric sarcoma types with their relative incidences as observed among 500 collected cases culled from the literature is as follows

1 Lymphosarcoma—42%
2 Leiomyosarcoma—20%
3 Reticulum cell sarcoma—9%
4 Hodgkin s disease—9%
5 The angiomatous sarcomas—4%
6 Fibrosarcoma—3%
7 Neurogenic sarcoma—2%

hemorrhage perforation or suicide Ordinarily far removed metastasis occurs before local extension It is common for carcinoma of the cardia to infiltrate up into the esophageal wall early however as discussed in the preceding chapter Infiltration of antral tumors into the duodenum is not an unusual late event although one frequently encounters statements to the contrary Duodenal invasion is found at autopsy in about 8 per cent of all cases of gastric carcinoma regardless *of the tumors points of origin*

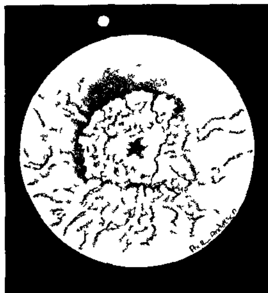


FIG 72 Gastroscopic view of Borrmann Type I carcinoma which fills the antrum and extends back into the pars media

OBJECTIVE STUDY

Laboratory study does not often assist diagnosis but is essential of course in the general evaluation of the patient Discovery that blood is persistently present in the stools is a *helpful warning in gastroenterologic practice* and often it is this that leads to study for gastric cancer In spite of the relative infrequency of gross hemorrhage all Borrmann types of cancer commonly leak small amounts of blood as they grow and become eroded or ulcerated As previously mentioned permanent *achlorhydria* is found in about two thirds of the cases The common routine of performing a gastric analysis in cases of suspected cancer however does not give very much information about the patient and his disease

In order to diagnose gastric cancer it is necessary to get much closer to the stomach and its lesion Except when it is possible to biopsy a metastatic lesion for a specific histopathologic diagnosis efforts at diagnosis *should be expended largely on roentgenologic* and gastroscopic study Although exfoliative cytologic examination is generally not nearly as useful as either it can be of decisive help when unequivocally positive results are obtained The two features of the cancerous stomach which assist the roentgenologist and gastroscopist most in making the diagnosis are the configuration of the lesion itself and its effects on gastric motility Configuration is best thought of in terms of the Borrmann types To both the roentgenologist and gastroscopist a cancer may appear as a discrete polypoid mass an elevated even ulcer niche an irregular ulcerated plaque or merely an area of stiffness It is not possible to explain why these features in some very small lesions *are clearly apparent* while occasionally a relatively large cancer escapes detection altogether In general the main contribution of the roentgenologist is detection and that of the gastroscopist identification The former can tell better about motility and the latter has the interpretive advantage of looking at *the lesion itself rather than at its mere profile* Diagnostic problems are discussed in the last section of this chapter

COMPLICATIONS

A relatively small proportion of patients with gastric carcinoma die of complications other than those which may result from surgical therapy Obstruction at the lower end of the stomach is by far the commonest complication and it can be anticipated that about one third of all patients will *develop* partial or complete obstruction at some point in their course if left unattended Although pyloric cancers always show a tendency in this direction those of the antrum may at

carcinoma (Table 6) Gastric sarcoma like carcinoma is predominantly a tumor of men Second the appearances of the stomach upon roentgenologic and gastroscopic examination usually seem worse than one would suspect from the patient s general condition Third in spite of their bulkiness sarcomas infrequently cause obstruction at the gastric orifices Fourth gross bleeding is very much commoner from sarcomas than from carcinomas Finally by the time the patient s disease has run its course one usually concludes

TABLE 6 AGE AT THE TIME OF DIAGNOSIS PRIMARY SARCOMA OF STOMACH (22 CASES) COMPARED WITH PRIMARY CARCINOMA OF STOMACH (200 CASES)

Age (years)	*Sarcoma* %	*Carcinoma* %
21–25	41	4
26–30	14	2
31–35	23	7
36–40		3
41–45	9	7
46–50	4	7
51–55		13
56–60	9	13
61–65		12
66–70		16
71–75		10
76–80		3
81–85		1
86–90		2

that the illness was a little less inexorable than it would have been had the tumor been carcinoma

With these exceptions the symptoms and signs of sarcoma are quite similar to those of carcinoma

INDIVIDUAL TUMOR TYPES

Lymphosarcoma the most common sarcoma of the stomach has a few histopathologic variations and many gross ones Approximately half are diffuse or partially circumscribed infiltrating (type 1) submucosal tumors (Fig 73) The degree of infiltration may be tremendous producing in the mucosa a heavy frozen appearance and making gastric distention impossible Occasionally the mucosal surface of the tumor is remarkably uniform and circumscript but more often it is irregularly nodular Ordinarily there is not much spontaneous ulceration although the tumor may respond to radiation therapy by extensive necrosis and tissue slough Any part of the stomach may be involved Lymphosarcoma is a notably radiosensitive type Unfortunately for radiotherapy lymphosarcoma often is a multicentric disease The chemotherapeutic agents especially nitrogen mustard may be remarkably effective temporarily

Leiomyosarcoma almost always tends to form spherical nodules in the gastric wall with or without diffuse infiltration (types 2 and 3) In the former case there may be pedunculation Ulceration comes late Roentgenologically hemispheric nodules are seen infringing on the gastric lumen Gastroscopically they have a soft appearance and the overlying mucosa has an unusually translucent quality Some leiomyosarcomas are moderately radiosensitive but most are not

Reticulum cell sarcoma shows no tendency towards any special configurational type except that it rarely becomes fungating Diffuse infiltration with or without localized nodules discrete nodules and large discrete ulcers may be formed (types 1 2 3 and 4) This tumor more than the others is likely to simulate simple benign ulcer Reticulum cell sarcoma is not radiosensitive

Hodgkin s disease as a multicentric process involves the stomach in about 1 per cent of all cases A few cases of apparently primary unicentric gastric Hodgkin s disease have been described Grossly the lesions may take the form of multiple polypoid masses on an infiltrating tumor plaque hard discrete tumorous masses or rather benign appearing ulcers (types 2 3 and 4) In the first the mucosal surface may be thrown into heavy fixed folds Chemotherapeutic agents and radiotherapy are temporarily effective Rarely is surgical removal indicated

The *angiomatous sarcomas* form a complex and rather special group Some members behave as benign tumors for long periods Even at autopsy it may not be possible to tell the

8 Plasma cell sarcoma—1%

9 Others myxosarcoma liposarcoma, rhabdomyosarcoma osteosarcoma chondro sarcoma multiple myeloma mixed types

In addition to these discrete tumors there are some diffusely infiltrating processes to consider The gastric walls of about 5 per cent of chronic lymphatic leukemia patients are found at autopsy to be infiltrated with specific leukemic cells producing diffuse rugal enlargement or scattered tumors Pseudoleukemia gastrointestinalis is an antediluvian term referring to heavy diffuse intramural infiltration of the tract from cardia to rectum with sarcomatous tissue or the characteristic tissue of Gaucher's von Jaksch's or other cytoproliferative disease The diagnosis is best designated according to the specific type of foreign cell responsible

GENERAL FEATURES

Specific clinical diagnosis of the histopathologic tumor type is almost always impossible unless tissue from metastases or multicentricity becomes available for biopsy There are not enough individual growth characteristics to permit roentgenologic or gastroscopic differentiation Even though some forms are better treated by x irradiation than by resection it is almost always found that surgical intervention is necessary before a specific diagnosis can be established Identification of the sarcomatous nature of a gastric tumor is usually difficult enough of itself Sarcomas may simulate carcinoma benign intramural tumors giant hypertrophic gastritis the granulomas and simple benign ulcers both roentgenologically and gastroscopically Nevertheless detailed attention to tumor configuration as revealed by these two technics sometimes permits one to be rather specific about the diagnosis of sarcoma in an occasional case

Some sarcomas grow exogastrically some intragastrically and some intramurally In these positions they may assume the cross sectional configurations shown in Figure 73 Naturally there is oversimplification in such a classification but the observed tendencies are helpful diagnostically as will be mentioned under the individual tumor types Sarcomas tend to maintain their original growth characteristics as they develop and they even return with the same general form after they have temporarily regressed in response to radiation therapy An exception is found in the degree of ulceration which is controlled by the relative ischemia of the tumor from

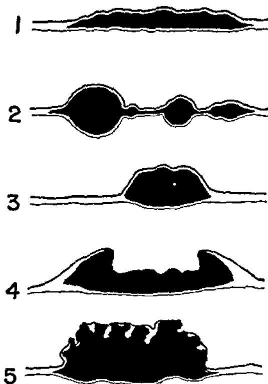


FIG 73 Diagrammatic representation of the gross growth forms ordinarily assumed by the gastric sarcomas

time to time There are no areas of the stomach which are especially prone to sarcoma development

Five general clinical observations are of interest if not of much concrete diagnostic help in comparing the behavior of primary gastric sarcoma with that of carcinoma Sarcoma tends to develop in people who are considerably younger than those affected by carcinoma Although sarcoma may first be recognized at any time from early youth to old age the mean age at the time of diagnosis is approximately 30 years earlier than it is for

TABLE 7 METASTASES FROM SARCOMA OF STOMACH (ALL HISTOLOGIC TYPES) AS FOUND AT AUTOPSY 22 PATIENTS IN WHOM THE TUMOR WAS BELIEVED TO BE PRIMARY IN THE STOMACH

Gastric nodes	11
Mediastinal nodes	5
Cervical nodes	5
Liver	11
Pancreas	9
Lungs	6
Heart	5
Skin	6
Omentum	5
Peritoneum	3
Colon	4
Small bowel	4
Mesentery	7
Spleen	6
Kidney	7
Adrenal	8
Pituitary	2
Bladder	2
Prostate	5
Mediastinum	5
Bone	1

discordant opinion (Fig 75)

The big problem is differentiation of benign from early malignant ulcers and as the clinician s experience accumulates he usually becomes increasingly humble over the deficiencies of his means of accomplishing this Recognition of benignancy in a lesion is more difficult than recognition of malignancy Certainty of diagnosis must necessarily decrease with diminished size and age of the lesion and an early accurate diagnosis therefore must be based on the most direct type of information It is clear that nothing to be discovered at the bedside can contribute to the specific differentiation if it is to be early Neither the duration of the illness the pattern of the symptoms the amount of weight loss nor the result of gastric analysis proves useful in differentiating a benign from a malignant lesion

The practice of waiting a few weeks in an undecided situation in order to observe any clinical roentgenologic and gastroscopic changes which may occur is generally to be condemned Whatever one s habit may be in treating localized stomach diseases—radical or supportive—the time for a precise diagnosis is now Neither clinical improvement upon medical treatment enlargement of the lesion healing of an ulcer disappearance of blood from the stool nor improved gastric motility through a diseased area gives information which helps differentiate benignancy from malignancy This is not to say that a decision must be made on the basis of the initial ex-

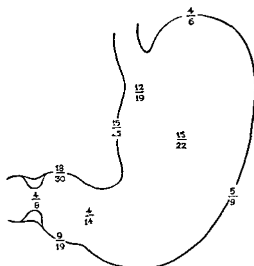


FIG 75 Diagnostic disagreements between examiners in 152 cases of gastric ulcer or carcinoma proved at operation or autopsy Denominators indicate number of lesions at the various locations Numerators indicate the number which were diagnosed correctly and with assurance upon initial study by both the roentgenologist and gastroscopist

aminations if they are inconclusive and many an interpretational problem is dispelled at once by a second examination Both a repeat roentgenologic and a repeat gastroscopic examination can be expected to improve the accuracy of the initial impression by at least 10 per cent But it is not necessary to wait for the lesion in question to change in order to realize the additional help of a second examination It is unexplainably common to find that a second examination made only a day after the first gives an impression which is entirely different from the initial one

benign from the malignant and some which histopathologically seem benign metastasize freely About 0 01 per cent of all gastric tumors have their origin from the blood vascular or lymph vascular systems They may make their presence known during any age period by hemorrhage in about 40 per cent of cases abdominal pain in 30 per cent and tumor mass in the rest Any part of the stomach may be involved and sometimes



Fig 74 Neurogenic sarcoma almost filling the antrum as an ovoid mass

multiple lesions develop Those that grow exogastrically sometimes become huge Whether they extend into the gastric lumen or into the peritoneal cavity angiomas tend to become pedunculated and most remain circumscript They take the form of simple spheres or grossly lobulated spheres They have a soft appearance when examined endoscopically During life some are blue some dark red and some yellow red Diagnosis is sometimes possible gastroscopically and the radiologist may suggest angioma if he recognizes calcified phleboliths in an intramural gastric tumor Although some angiomatous sarcomas are remarkably radiosensitive all should be removed surgically Even if metastasis is already evident the danger of hemorrhage from the primary tumor may be judged a proper indication for its extirpation

Fibrosarcomas like the benign fibrous tumors frequently have a compounded histopathologic pattern Most assume a circumscribed spherical form or some simple variation on this general theme In von Recklinghausen s neurofibromatosis with gastric involvement fibrosarcoma develops in about 10 per cent of the cases There is no radiosensitivity

Neurogenic sarcoma similarly most often begins as a spherical or ovoid mass (Fig 74) Ulceration is common There is no radiosensitivity

METASTASIS

Metastasis is erratic and unpredictable among the gastric sarcomas A tumor s urge to metastasize seems unrelated to its histopathologic degree of malignancy Although it is sometimes said that certain types metastasize late or infrequently it is dangerous to make clinical decisions on such generalities Metastases may reach almost any organ both lymph vascular and blood vascular systems being utilized General tendencies are illustrated in Table 7

PROBLEMS IN THE IDENTIFICATION OF GASTRIC LESIONS

Detection of localized lesions in the rugose plastic stomach is one of the more hazardous of gastroenterologic diagnostic efforts Once a lesion has been found the difficulty of establishing precise identification is sometimes insuperable short of surgical exploration A good portion of the gastroenterologist s time is spent in wondering what little deformities in stomach roentgenographs signify and in ironing out differences of diagnostic opinion among various interested parties If more than two or three people enter into the diagnostic effort there often will be

identification is not possible The antrum and the cardia are the difficult regions for him the former being notable for its confusing dynamic deformities and the latter being inaccessible to compression and palpation

The over all diagnostic accuracy of one gastroscopic examination is about 85 per cent if the lesion can be visualized Sometimes a tumor or large ulcer is found gastroscopically in a stomach which roentgenologically has appeared normal but more often the reverse is true No one knows how often neither detects extant disease Inability to see the lesion is responsible for most gastroscopic errors The most important blind area is the lesser curvature of the quiet antrum although active peristalsis ordinarily brings most of it into view The normal pyloric canal cannot be examined and if disease is seen within the pylorus it almost always proves to be cancer The instrument itself produces a blind area within its axis on the posterior wall and the greater curvature against which it impinges Improved instruments now permit good visualization of the fundus Whether one is considering roentgenologic or endoscopic errors he must admit that the experience and ability of the examiner exert a paramount influence over accuracy The competence of an observer remains unmeasurable however whatever his results seem to show

Scriptive comment cannot supply information which is particularly useful for learning how to distinguish between benign and malignant lesions A few points may be mentioned as generalities It is not realistic to perpetuate the old chestnut that because the pathologist often cannot tell if a lesion is benign with the stomach in his hand the clinician should not presume to make the distinction The roentgenologist and gastroscopist have tremendous advantages over the pathologist in this connection being able to benefit from information supplied by the living rugal pattern the stomach s motility about the lesion in question and color characteristics of normal and abnormal areas These are very important matters The surgeon it is to be noted is at a relative disadvantage and it is a distressing fact that sometimes at laparotomy even with the help of gastrotomy he is unable to find a lesion which is known to be present let alone identify it As a rule if on the basis of preoperative studies it is decided that gastrectomy should be carried out because of a gastric lesion it is a mistake to desist because the stomach looks and feels normal at operation

The size and location of an ulcer do not help in differential diagnosis Most cancers are larger than most benign ulcers but often enough the latter are huge at the time they are first discovered Giant benign ulcers are frequently located on the anterior or the posterior wall of the pars media Their minute features are better studied gastroscopically than roentgenologically Ulcers on the greater curvature are by no means always malignant Between 5 and 10 per cent of proved benign ulcers are located precisely on the greater curvature Similarly ulcers of the prepyloric area are just as often benign as malignant If during roentgenologic study an active ulcer is found in the duodenum a companion ulcer observed in the stomach is very likely to be benign Gastric carcinoma is not rare however in people with old inactive duodenal ulcer

The configuration of the base of a crater does not often give information about its nature All degrees of unevenness are encountered in benign ulcers Although the base of a malignant ulcer is sometimes elevated into the gastric lumen it may also penetrate beyond the lumen s profile The edges of a crater furnish the answer if one is to be had Folds rarely radiate from the very edges of an ulcerated carcinoma presumably because there is little contraction about such a lesion and because local infiltration smooths out the nearby mucosa To the gastroscopist the edges of a benign lesion are almost always even and form a regular line about the crater Although the Borrmann Type II carcinoma has a circumferential wall it is uneven or frankly nodular Undermining is an unusual feature of both benign and malignant ulcers

Diagnostic errors are correlated in a remarkable manner with failure of the different diagnostic methods to back each other up When radiologist and gastroscopist agree on a diagnosis the error is found to be only about 5 per cent A disagreement is an important warning and must always encourage repeat studies It is clear that if either examiner is to make a positive contribution his opinion must be a strictly independent one This is not easy for the gastroscopist for usually he will be cognizant of the roentgenologist s diagnosis and will have drawn his own conclusions from the films If he is fortunate enough to be the fluoroscopist too it will be especially difficult for him to maintain endoscopic objectivity

There is no competition between the examination methods One had best take advantage of all that are available for each



FIG 76 This is a typical roentgenologic picture of extensive gastric malignancy and any other interpretation would have been wrong (compare with Figure 70) The gastroscopist agreed The stomach was resected and detailed histopathologic study failed to reveal any sign of malignancy The diagnosis was benign ulcer In retrospect there seemed to be no way in which a similar error could be avoided in the future

can make a positive contribution An unequivocally positive cytologic study puts an end to diagnostic uncertainty A negative study supplies no help The over all diagnostic accuracy of one roentgenologic study for localized gastric disease is about 75 per cent If a gross lesion is present the roentgenologist can almost always find it even if specific

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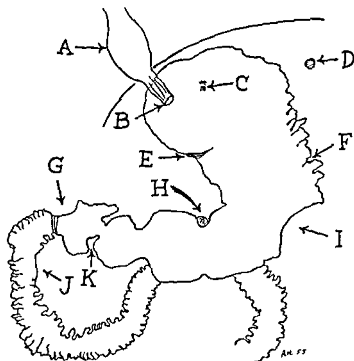


FIG 77 More pitfalls of gastric roentgenography *A* Esophageal ampulla too often confused with hiatus hernia *B* In the anteroposterior roentgen projection the narrow esophagogastric tube normally empties into the sac of the stomach far below the fundal profile *C* Linear calcifications in this general region are almost always due to a normal calcified costal cartilage *D* Circular calcifications far below the diaphragmatic profile may be in the lung Probably splenic (and hepatic) calculus is too often diagnosed because of failure to recall how far below the crest of the diaphragm the posterior pleural reflexion lies *E* In the upright position a puddle of barium simulating ulcer frequently accumulates here due to a little cascade effect produced by the posterior position of the normal gastric fundus *F* The rugae of the greater curve's upper two thirds are normally large and the configuration they produce must not be confused with tumor *G* A smooth crescentic defect here is usually produced simply by a normal gallbladder *H* A bit of normal duodenum projecting above the lesser gastric curvature must not be misinterpreted as gastric ulcer *I* A smooth defect here is usually produced by the pressure of normal colon *J* Flattening of the medial border of the duodenum at this point is usually due to the pressure of the normal common duct *K* When the pylorus contracts some mucosa is normally squeezed into the base of the bulb This is not mucosal prolapse

tion of duodenal bulb and second portion of the duodenum Proximal to this line congenital duodenal anomalies are rare Distal they are common As a general rule the more common a duodenal anomaly is the less its clinical importance proves to be A striking clinical feature of some of the symptomatic congenital anomalies is their *tendency to wait until adult life before causing* important trouble There often is a history of feeding disturbances during infancy spontaneous recovery during the first year and then no definite digestive problem until the third or fourth decade One can only assume that initially effective compensatory mechanisms develop but that these are gradually overcome as adulthood progresses To the clinician there is the warning here that acquired duodenal symptoms of the adult are not necessarily due to acquired disease

Errors of rotation are very common Many patterns may be formed and classification of the types is a rather pointless pastime Proper interpretation in individual cases is something which can be worked out only through roentgenologic study There are no symptoms and clinical importance is confined to the technical problems presented to the surgeon who is at work in the region

Congenital atresia of the duodenum on the other hand is very rare occurring only about once in 20 000 live births It is of course incompatible with life unless a bypass is created surgically Although the whole small bowel may be atretic local segments are more usually affected The commonest site is the junction of the bulb and second portion where the primitive foregut and midgut join The region of the duodenojejunal junction is next most common The diagnosis of this or some other pyloric or duodenal *obstruction is suggested when a neonate* begins to vomit immediately after birth Contrast fluoroscopy may prove successful for localizing the orad level of the obstruction but the extent of the lesion and feasibility of operative correction can be determined only by surgical exploration The optimum procedure is a by passing duodenojejunostomy Prognosis for long postoperative survival is poor largely because most patients are premature babies who withstand the necessary few days of preoperative delay poorly

Sometimes atresia takes the form of a mere *perforated septum* across the duodenal lumen It usually lies just above the papilla of Vater Frequently this lesion is not discovered *until the patient has reached adult*hood Then pain and vomiting which may have been cyclic but mild since childhood become severe sometimes quickly so Surprisingly in spite of the chronic obstruction no or very little gastric dilatation develops The first and second portions of the duodenum however become tremendously dilated Together they may be as large as the stomach Sometimes fluoroscopic examination permits detection of the septum but more often the ballooned out and redundant duodenum obscures the cause of obstruction *Treatment is necessarily surgical*

Congenital bands and membranes are not uncommon in the right upper abdominal quadrant but they do not often produce gastrointestinal problems They probably represent remnants of the ventral mesogastrium It has been demonstrated that thin incomplete congenital membranes of one sort or another can be found in this area in about 20 per cent of neonates They almost always *disappear during the first* year or so of life Membranes and bands which cause trouble during adult life seem too tough and precisely located to be related to these filmy remnants and their embryologic associations are not understood

Cholecystoduodenocolic (Harris) ligament is most common among those which cause duodenal symptoms It is believed to represent the caudal remnant of the ventral *mesogastrium Actually* although this ligament is encountered frequently at abdominal operation only a small proportion produce duodenal obstruction The ligament usually crosses the duodenum at the junction of bulb and second portion Because it is inserted into the anterior serosal aspect of the transverse colon drag on the colon increases

CHAPTER 7

DUODENUM

INTRODUCTION

The duodenum lies in a particularly vulnerable portion of the abdomen Although largely retroperitoneal it is expected to behave as an intra abdominal organ About its second part in an area which can be covered by a 25 cent piece there are seven organs which may undergo carcinomatous change and many other tissues which are susceptible to sarcoma Because of retroperitoneal fixation and inability to escape near by expanding lesions duodenal obstruction is a common result of several regional diseases The duodenum lies in contact with the largest blood vessels of the abdomen with the collecting point for the intestinal lymphatic system and with the hub of the gastrointestinal autonomic system Because it receives their ducts it can control the physiology and health of both pancreas and liver In spite of all the medical potentialities created by its anatomic fortunes the duodenum will no doubt continue to occupy medical thinking largely in connection with the ulcer problem

An important clinical characteristic of any disease which results in passive stretching of the duodenum either by mild brief motor dysfunction or by chronic obstruction is a set of symptoms which arise through altered autonomic reflexes These are not just nervous reflexes but a group of specific far removed responses Thus faintness waves of sweating and mild panic tachycardia tinnitus sudden weakness and headache are common manifestations of incomplete duodenal obstruction Often the picture is that of migraine and it is in caring for this group of patients that the gastroenterologist becomes involved in the migraine problem

CONGENITAL ANOMALIES

The primitive foregut and midgut join at the line which marks in the adult the junc

perforation as a complication does not occur

Treatment is never very profitable Many varieties of surgical drainage technic ordinarily involving either duodenojejunostomy or gastrojejunostomy have been used The problem is of course that the dilated nerveless duodenum cannot become smaller however easily it may empty If there is no actual mechanical obstruction and no important complication it is doubtful if megaduodenum should be treated surgically

ARTERIOMESENTERIC OBSTRUCTION

Normal anatomy of the third duodenal segment calls for its fixation posteriorly against the spine and its traversion anteriorly by the superior mesenteric artery vein and nerves Sometimes this arrangement results in compression of the duodenum and chronic intermittent obstruction This is arteriomesenteric obstruction It is probably an overworked diagnosis being easily confused with congenital nonobstructive megaduodenum

The condition is almost always encountered in thin people and women are most often affected It often is accompanied by general visceroptosis A flabby abdominal wall is usually part of the picture Presumably small bowel ptosis can increase tension of the superior mesenteric artery against the duodenum Perhaps there is also a low take off of the artery from the aorta in some cases Although symptoms may go back to childhood they usually do not lead to search for an explanation until the fourth or fifth decade Because delay in duodenal transit is intermittent the symptoms are periodic The complaints are those of duodenal dilata



FIG 78 Congenital nonobstructive megaduodenum

constriction of the second portion of the duodenum The manifestations of obstruction are intermittent probably for this reason Characteristically the patient is between 20 and 35 years of age when symptoms begin A history of childhood digestive troubles is not usual The symptoms may suggest duodenal ulcer chronic gallbladder disease or hiatus hernia Roentgen study often shows the constriction clearly just caudad to the duodenal bulb The stomach may be dilated with considerable delay in emptying Exact anatomic relations can be elucidated only by inspection at operation Surgical division of the ligament is a simple matter

CONGENITAL NONOBSTRUCTIVE MEGADUODENUM

Megaduodenum is a term which has been used in a number of nonspecific and confusing ways It seems wise to encourage the current trend to reserve the term for the duodenum which is large because of intrinsic malfunction in the absence of any organic obstructive element The causes of chronic megaduodenum appear to be limited to congenital absence of ganglion cells in the ganglia of Auerbach s plexus and to acquired degeneration of a similar type which causes loss of intrinsic nervous control The concept of an acquired form seems valid enough but determination that the defect is an acquired one in any particular patient is a tenuous matter indeed The problem of excluding an extrinsic obstructing factor particularly arteriomesenteric obstruction is not always as easy as one might guess As is the case with any part of the alimentary tract the ganglion cells of the duodenum which becomes passively dilated quickly undergo degeneration In several situations in which the duodenum s nervous control becomes momentarily paralyzed such as some cases of severe acute infectious disease acute toxic gastric dilatation and acute necrotizing pancreatitis temporary dilatation of much smaller degree may occur

Congenital nonobstructive megaduodenum cannot automatically be assumed to have a neurologic fault *similar to that either of* achalasia of the esophagus or of congenital megacolon and specific etiologic information is not available It is a temptation to postulate that a distal duodenal or jejunal aganglionic segment produces functional obstruction and necessitates an excessive amount of muscular activity on the part of the neurologically normal proximal duodenum Perhaps there is muscular hypertrophy during the stage of compensation followed eventually by functional decompensation dilatation thinning of the wall and degeneration of Auerbach s ganglia This course of events has not been proved

The disease usually comes to medical attention during early or midadult life although the symptoms are often related back to childhood Occasionally marked dilatation is encountered in infants There appears to be no sex predilection The common complaints are epigastric pain with waves of nausea periodic vomiting anorexia a feeling of gas on the stomach without the ability to move it eventual weight loss and rarely bleeding It is common for the patient to have far removed autonomic symptoms as mentioned above Physical examination is ordinarily normal unless undernutrition has developed Dull epigastric tenderness may be found and occasionally a soft mass is felt or even visualized as an elevation of the abdominal wall to the right of the umbilicus

Upon roentgenologic examination a very large duodenal bulb and descending duodenum are found (Fig 78) There is lengthening as well as dilatation and the picture may be confused by the formation of pseudodiverticula and foldings Frequently dilatation ends as the transverse duodenum crosses the spine Then arteriomesenteric obstruction may be suspected Sometimes all of the duodenum and a portion of the jejunum are involved The stomach is never dilated and it may actually be narrower than the diseased part of the duodenum

The complications are those of stasis—*nonspecific mucosal inflammation bleeding* and periduodenitis with adhesions Apparently

is visible There may be diffuse tenderness in the region

This is a disease which can be diagnosed with assurance only by roentgen examination (Fig 79) Sometimes a plain film of the abdomen shows a large bubble of air which can be interpreted as evidence of megaduodenum With contrast technic the bulb and second portion of the duodenum appear enlarged sometimes with pseudodiverticulum formation and foldings The degree of megaduodenum is not as great as that ordinarily found in the congenital non obstructive type and unlike the latter at certain times during the course of the disease examination may show a rather normal appearing duodenum At such times duodenal transit time may be normal but usually there will still be stasis and even retention for hours The diagnosis should not be made unless it is possible to demonstrate the path of the compressing superior mesenteric artery across the duodenum It is necessary to remember that the artery is enclosed in the mesentery along with vein and nerves so that a sharp line is not produced Nevertheless this is a simple mechanical disease and if the organ is being compressed by mesenteric structures this fact should be radiologically demonstrable It is through inconclusive diagnostic interpretation that the disease s reputation has suffered The problem is that an enlarged redundant duodenum often overlaps the line of artery crossing Downward pressure over the lower half of the abdomen with lateral pressure over the duodenum may make visualization easier

The best treatment is that which is described under the subject of visceroptosis—exercises posture improvement and corsetting Theoretically surgical by pass of the obstructing artery should be simple and effective but the results are at times disappointing Possibly this is due in some cases to a noncritical diagnosis

DIVERTICULOSIS

Duodenal diverticula are common Whether or not they should be considered congenital lesions is largely a matter of semantics They are acquired due presumably to inborn inability of the mature duodenal wall to resist normal intraluminal pressures They are not present at birth and are very rare in infants Being pulsion diverticula they develop slowly in response to pressure influences and their incidence increases steadily from adolescence through old age The general incidence at autopsy among adults of all ages is about 3 per cent and that at autopsy of geriatrics patients is about 8 per cent The incidence as determined by roentgenologic study is approximately the same By the time the patients reach the age of 60 years about 15 per cent have multiple diverticula There is no sex predilection Duodenal diverticula are commonly associated with diverticulosis of other parts of the gastrointestinal tract and with hiatus hernia

Duodenal diverticula are simple lesions representing merely bulges of the organ s wall Small ones retain the muscle layer but this thins out and disappears with enlargement The lesion then becomes a hernia of the mucosa through a defect in the muscle layer The classical habit of labeling diverticula as true and false according to the presence or absence of a muscle layer has no meaning Almost all diverticula develop from the inner aspect of the duodenum s loop and most of these spring from areas within 2 cm of the papilla of Vater (Fig 80) The sacs usually enlarge against or into the substance of the pancreas Sometimes they burrow behind the organ and rarely they come to lie subperitoneally They may on rare occasions reach a diameter of 15 cm or more but growth is slow and near by organs are displaced very gradually without disturbance of function Less commonly the third and fourth portions of the duodenum are affected unless there be multiple diverticula when the papillary region and the third portion become common sites In not more than 1 per cent of the cases does the lesion arise from the outside of the duodenal loop The duodenal bulb is a distinctly rare

tion and stasis often most pronounced after meals at the onset but later troublesome at odd times throughout the day Epigastric dull or cramping pain and fullness are common They are usually associated with nausea and a fruitless urge to belch There may be periodic vomiting more often in the evening than after meals Autonomic disturbances and headache precede vomiting and the picture therefore may simulate migraine closely This plus the overt emotional disturbances of many of the patients often makes one wonder how much of the picture should be explained on the basis of obstructive megaduodenum



Fig 79 Arteriomesenteric obstruction of the duodenum The bulb is only a little enlarged Barium suspension has been held up in the transverse portion of the duodenum by incomplete obstruction produced by arterial compression

Not often does the patient discover an effective device for obtaining relief during symptomatic spells He may have an urge to lie down because he feels sick and this seems to help a little Occasionally the patient finds that quick relief can be had by lying on the left side or assuming the knee chest position This is the only part of the picture which permits one to assume immediately that the problem is a mechanical one

Examination characteristically shows a thin stoop shouldered lordotic woman with saggy abdomen and perhaps signs of malnutrition A soft mass representing distended duodenum may be palpable just to the right of the umbilicus Rarely peristaltic activity

counters patients with bleeding in whom detailed studies are normal except for the presence of a duodenal diverticulum It is almost always a mistake to assume that the cause has been found To be sure occasionally a case is encountered in which an abdominal aortic aneurysm has leaked into an adherent diverticulum or an aberrant pancreatic nodule has become ulcerated and bled But the danger of underestimating the importance of such a rarity is nowhere near as great as is that of using the diverticulum as a diagnostic excuse when no other disease can be found

Due to their anatomic relationships diverticula on rare occasions can cause intermittent obstruction of the common bile duct and of the duodenum itself In the former instance the filled sac merely exerts pressure against the retroperitoneal portion of the duct A large diverticulum when full is able to press against the inner aspect of the duodenal loop in the region of the lesion s neck Because of the ease with which the lesions empty these are ordinarily very temporary postprandial effects

In spite of the potential complications duodenal diverticula hardly ever can be blamed for upper abdominal symptoms Discovery of a diverticulum in a patient with any type of pain or dyspepsia should not cause the doctor to feel much closer to the patient s problem Treatment is indicated only in the most exceptional case It involves surgical extirpation often a difficult technical procedure If the sac must be separated from the pancreatic substance there is considerable risk of postoperative leakage of pancreatic enzymes Although dietary therapy is often recommended for duodenal diverticulum it is quite clear that if diet helps the patient s symptoms were not caused by the diverticulum

TRANSPYLORIC PROLAPSE OF THE GASTRIC MUCOSA

When the normal pylorus closes down in systole a little lax mucosa is squeezed out its distal end so that at fluoroscopy it is often found that the base of the barium filled duodenal bulb is indented a little Sometimes a mucosal fold or two persists from stomach through pylorus into the bulb when the gastric antrum is in systole If the antral mucosa is unusually mobile over the stomach s muscularis propria it may be lifted by antral peristalsis and carried as a sleeve through the pyloric ring into the bulb Unless there is a mucosal tumor which has acted as a passive object for initiation of the mucosal migration the condition is called simply prolapse of the gastric mucosa It is a condition which can be detected and studied only during roentgenologic examination although the abnormal degree of mucosal mobility may be demonstrated at operation or autopsy

During the nine years which followed initial popularization of the diagnosis in 1946 more than 170 clinical papers appeared on prolapse of the gastric mucosa Quick acceptance and early enthusiasm were registered from all parts of the world The more experienced clinicians responded with dismay at what they believed was just another in a long series of minor anatomic peculiarities which have for years been proposed one after another as explanations for functional dyspeptic symptoms Prolapse has always been with us they said Why is it just now starting to cause illness? But in some centers the diagnosis was considered to imply such serious disease that subtotal gastric resection was routinely recommended for treatment Now 10 years later it appears that the flurry has largely died down and there is little danger of its arising again Prolapse of the gastric mucosa does not appear to be a source of symptoms Although early reports stated that the prolapsed segment could become traumatized by pyloric activity with formation of erosions and bleeding this is a very rare complication The whole experience leaves a spectacularly taught lesson for which all young clinicians should be grateful

The importance of prolapse lies in the interpretational confusion it may cause during roentgenologic examination of the duodenal bulb Excess migrant mucosa extends

site for true diverticulum formation and although apparently valid instances have been reported almost all bulbar pouches represent the results of contraction and deformity secondary to ulcer healing

A small proportion of duodenal diverticula become complicated Spontaneous perforation is very rare It has been reported drainage during natural posturing is made easy because its walls are *fixed in place* by the surrounding tissues

Duodenal diverticula are common sites for aberrant pancreatic rests These are able to undergo all of the pathologic processes to which the pancreas proper falls heir including acute pancreatitis and malignant change



Fig 80 Multiple duodenal diverticula

almost exclusively in old people and it is *said that the symptomatic* picture simulates that of acute cholecystitis The cause of perforation is believed to be obstruction at the sac s neck with development of acute diverticulitis and transmural necrosis Usually the neck of a duodenal diverticulum is large and even though its sac may sometimes retain material for several hours gravity

In this location however they rarely do The presence of these small tumors usually is suspected only because they are encountered as conical or polypoid filling defects on the diverticular wall during roentgenologic examination

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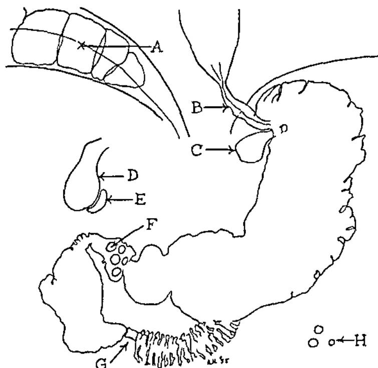


FIG 81 Presentation of certain upper abdominal abnormalities as they are observed roentgenologically *A* Phrenohepatic interposition of the colon (Chilaiditi s anomaly) *B* In achalasia the length of the narrow segment is influenced to a considerable extent by the phase of respiration *C* Gastric diverticulum springing from usual site on posterior wall close to the lesser curve at the cardia *D* Layering of tiny radiolucent gallstones demonstrable upon cholecystogram only if a film is taken with the patient upright *E* Phrygian cap *F* Hyperplastic brunnerian tissue producing the picture of polyposis on contrast fluoroscopy *G* Impression of the superior mesenteric vessels in arteriomesenteric obstruction of the duodenum *H* Occasionally on a plain film of the abdomen a diagnosis of diverticulosis coli can be made by detecting gas filled diverticula

out into the duodenal bulb in approximately 8 per cent of patients who come to upper gastrointestinal fluoroscopy The prolapsed segment forms a radiolucent defect which fills the base or all of the bulb The contrast medium in the remainder of the bulb assumes a configuration which has led to the designation umbrella deformity Sometimes strangely complex radiologic patterns are produced and there is danger of misinterpreting them as indicative of duodenal polyps or even duodenal ulcer Demonstration of mucosal prolapse is always warning that an antral mucosal tumor may be present If such cannot be excluded roentgenologically gastroscopic examination is indicated When the stomach is insufflated for gastroscopy the antral mucosa must return to its normal position so that the prolapse itself cannot be detected

DUODENITIS

NONSPECIFIC DUODENITIS

Like the mucosa of any part of the body that of the duodenum is subject to inflammatory change Nonspecific duodenitis is a histopathologically acceptable disease or

group of diseases As a clinical entity how ever it is a very difficult concept to deal with It is possible that short lived diffuse inflammation occurs rather commonly from time to time in response to such influences as systemic toxicity acute infectious diseases and allergic reactions If simple inflammation in this location can of itself be responsible for illness the fact cannot be established clinically There is no symptomatic picture or roentgenologic or laboratory information which permits one to establish with assur ance a diagnosis of duodenitis Susceptibility of the duodenal mucosa to agonal and post mortem autolytic changes renders autopsy opinion rather inconclusive Occasionally the vacuum biopsy tube can be worked down into the duodenum and a mucosal specimen taken here but this is not a practical way clinically to study duodenal disease The problem is reminiscent of the history of gastritis which was surrounded by confusion until its histo-pathology was made the baseline for evaluat ing clinical roentgenologic and endoscopic observations Until a technic becomes avail able for objective study of duodenitis how ever clinical impressions must dominate

A source of confusion to the clinician is the readiness with which some radiologists are willing to diagnose duodenitis while others deny the entity entirely The disagree ment arises over whether a certain pattern of muscular irritability can be translated into a diagnosis of mucosal inflammation The possibility that undetected ulcer is re sponsible for duodenal irritability and the realization that the thickness of duodenal folds is usually controlled by factors which are physiologic are enough to make skeptics of most clinicians

It is believed that primary nonspecific duodenitis by itself is rarely an acceptable explanation for symptomatic illness Duode nitis as a mere secondary manifestation of other disease such as strongyloidiasis or allergy is a proper clinical and pathologic diagnosis Nonspecific duodenitis appears to have no important pathologic significance and in particular it does not seem to be a precursor of duodenal ulcer

GIARDIASIS

Giardiasis is a simple filth infection with the flagellate protozoan *Giardia lamblia* The duodenum upper jejunum biliary tract and gallbladder are the areas involved The parasite lives in the lumen of the affected organs as the motile trophozoite and prob ably it is able to attach itself to the surface epithelial cells It produces no morphologic change in the cells and in fact no tissue injury can be demonstrated The organism is not a tissue invader although the tropho-zoite may penetrate the mucosal surface superficially after death of the host Encysta tion occurs in the fecal stream unless diarrhea prevents the process through speed of transit and lack of fecal dehydration Biliary giar diasis is discussed elsewhere

Giardiasis is a common infection ac quired by ingestion of the cysts in contami nated food or drink It has been found in every part of the world its incidence among chil dren being consistently higher than that among people in late adult life An infection can never be designated as light or heavy except for the moment because the numbers of parasites in any individual are constantly varying according to changes in local bowel conditions A high protein diet may by itself cause an infection to die out as may pro longed fever due to some unrelated disease A high-carbohydrate meat free diet may be accompanied by a tenfold increase in the daily fecal output of cysts

Giardia lamblia is a borderline parasite at its worst and in almost all adult intestinal infections it behaves as a commensal In the biliary tract it may be a more potent parasite Probably in infants and children intestinal giardiasis may at times be respon sible for mild diarrhea It seems to do little else There are no systemic manifestations The blood picture is not disturbed

Diagnosis is made by stool examination The cysts are easily identified by the trained parasitologist With the help of the zinc

sulfate flotation technic great numbers of cysts are often found in the preparation

A seven day course of Atabrine 0 3 gm daily is remarkably effective in eliminating the infection Reinfection is of course possible any time thereafter The clinician must formulate his own philosophy for resolving the quandry created by a rather harmless infection which is easily treated If he decides to treat giardiasis whenever he encounters it he will feel more benefit as a result than will his giardiasis patients

STRONGYLOIDIASIS

The adult nemathelminth *Strongyloides stercoralis* matures and oviposits in the duodenal and jejunal mucosa after its migration as a filariform larva has carried it from the ground through the skin to the lungs via the circulation and thence via bronchi and esophagus to the small bowel Although the female oviposits the eggs hatch within the mucosa in her immediate vicinity and the emergent rhabditiform larvae must migrate through the mucosa into the bowel s lumen before they can be passively expelled in the feces to continue propagation The processes of hyperinfection and autoinfection can occur in strongyloidiasis so a patient s worm burden may increase without further acquisition from infested soil The important threat to the patient occurs during the period of larval migration through the lungs Fatal bronchiolitis is not rare following sudden acquirement of a heavy infection

Strongyloidiasis is a disease of both temperate and tropical regions Although its distribution is partially limited by the hibernal frost line it has been acquired in a few instances as far north as southern Canada and upper New York State

Strongyloidiasis can be a serious acute disease but more often it causes mild chronic illness The clinical picture tends to be non specific and it is often difficult to localize the source of symptoms In the great majority of patients the process of transpulmonary migration is a silent one so that there is little hint from the history regarding the course of events A brief period of pneumonia may occasionally be suggested from previous symptoms and if the patient was studied at the time the diagnosis of Loeffler s syndrome may have been made Some of the adult worms may remain in the lungs and then larval production is capable of producing recurrent pneumonia In the duodenal mucosa the adult worms which measure only a couple of millimeters in length are capable of producing moderate damage Common symptoms are those which are created by upper gastrointestinal irritability —patternless upper abdominal pain gas quick filling at meals easy vomiting mild diarrhea and nervousness In the rare case of severe chronic infection there may be considerable weight loss severe diarrhea and chronic invalidism Upon abdominal examination of the more typical patient tenderness is usually found in the epigastrium There is almost always eosinophilia and some of the highest eosinophilias encountered in medical practice are those which accompany strongyloidiasis Because the worms remain tissue parasites the eosinophilia is persistent unlike the situation among helminths which have only a brief tissue phase Upon roentgenologic examination of the upper gastrointestinal tract it is sometimes found that the second and third portions of the duodenum are remarkably irritable with very rapid transit time The roentgenologic diagnosis of duodenitis in a patient with eosinophilia gives reason to suspect strongyloidiasis (Fig 82)

Diagnosis depends on microscopic identification of the rhabditiform larvae in the stool or in duodenal aspirates It is not known how many larvae from each female enter the bowel lumen daily but compared to the other nematodes which infect man the daily output of progeny appears to be small Larvae are rarely abundant in material which is used for examination however it is prepared They can be concentrated from the feces by the zinc sulfate flotation technic although only with considerable distortion Unsuspected cases may thus be encountered

during routine stool examination If the disease is suspected however stool examination by itself is not sufficient to exclude the diagnosis Examination of material aspirated from the duodenum and centrifugalized should be carried out in addition to multiple stool examinations It is not clear why duodenal aspiration should be more productive than stool concentration in view of the fact that the adult worms are often scattered through much or most of the small bowel but clinical experience proves it to be so

in some cases But some lots of gentian violet which is a rather crude material cause severe phlebitis even when the dose is diluted to 1000 ml of isotonic saline solution If local phlebitis develops there is little to do but discontinue therapy No other drug has been found to be useful

DUODENAL ULCER

Duodenal ulcer is such a common disease in practice that it has become frighteningly routinized and disassociated from patient in



FIG 82 Outspoken diffuse duodenitis in patient with strongyloidiasis This degree of roentgen change is unusual

Treatment is a very discouraging matter Even though by the time the adult worms have settled down in the bowel mucosa the main danger of the infection has passed autoinfection makes it possible for the cycle to be repeated and the infection to grow progressively more severe There is also the public health problem although this is handled largely through education of the patient Oral and intraduodenal use of gentian violet has no useful effect at all in spite of the fact that it is so often recommended Intravenous gentian violet in a daily dose of 25 ml of 0 5 per cent aqueous solution for 20 days has proved remarkably effective

dividuality There are recommended routine means for ulcer diagnosis and for ulcer treatment The relative effectiveness of ulcer drugs is judged on the basis of group response Conversely what is best for one patient is assumed to be best for all The result is de individualization of the disease which more than any other in gastroenterology requires individualization But duodenal ulcer—the lesion itself—is a local manifestation not a disease The disease is a general body disorder involving disturbances of the emotions endocrine balances nervous regulations and vascular responses It is not the ulcer that makes a person sick

he has an ulcer because he is sick This is the reason for individualization and the need for expanding the concept of the ulcer patient s illness to encompass all general and focal manifestations Some patients react to their over all problem by ulcerating the duodenum some with asthma some with thyrotoxicosis some with hypertension some with colon disease etc It is unfortunate that study of the patient with duodenal ulcer permits concrete documentation of only one pathologic lesion the little ulcer and that the disease was named for the obvious organic manifestation rather than for the psychovisceral complex which is the real illness Patients with duodenal ulcer would be better off if there were a machine to express their emotional problems in terms of a number on a laboratory report or a shadow on an x ray film

THE ULCER PATIENT

It is said that 10 per cent of American men have or will have an ulcer and this appears to be a fair estimate There is a strong familial incidence Ulcer is the commonest cause of chronic indigestion among men There seems to be a rising incidence among the women of this country and of Europe men now predominate in a proportion of only about 3 5 1 The incidence among American Negroes has been increasing rapidly so far during the Twentieth Century The proportion of duodenal ulcer patients with type O blood is unaccountably high although the blood groups are normally distributed among patients with gastric ulcer

Ulcers may develop for the first time at any age Although usually first diagnosed during early adult life they frequently are encountered anew in old age Duodenal ulcer is an important geriatrics disease This may represent a change in the natural history of the disease for it has not been emphasized to any extent in the past Among women there is a tendency for onset and recurrence to follow the natural or artificial menopause Duodenal ulcer of neonates and children seems to be about as common as gastric ulcer although there is variance among different series on this point About two thirds of infants with ulcer are prematures and about half of those that die are found to have organic brain disease or damage showing this type to be a Cushing ulcer

Ulcer occurs in many personality types and under many circumstances The high pressure executive type seems particularly susceptible to this special form of psychovisceral disorder as is well known It is a mistake however to draw the categorization too tightly In a sense ulcers are caused by people and the ulcer patient is likely to be one who has problems not necessarily difficulties in his dealings with people The problem may be simply that of mechanical communication as illustrated by the inordinately high ulcer rate among deaf people On the other hand it may be much more complicated as suggested by the high incidences among political and military leaders and among second born children The invasion ulcer of soldiers and the honeymoon ulcer of both men and women are examples of acute ulcers which may develop during periods of unusual emotional stress But the situation itself clearly is not as important as the person s way of reacting to the situation The ulcer patient is a person who does not permit himself to be satisfied easily whether he governs an industrial empire or combs a beach

The factor of motivation is paramount in directing a patient s morbidity once an ulcer has formed but it does not seem to be important in selecting candidates for ulceration This is difficult to prove because the influence of motivation is so powerful that it itself can easily obscure incidence figures For instance although manpower loss due to ulcer is very much less in volunteer armies than it is among drafted armies a military unit s ulcer rate is considerably higher during easy periods of garrison duty than it is during periods of combat whatever its composition

It has been difficult to determine just how much influence the psychoses may have over

ulcer incidence Probably duodenal ulcer is not as rare among psychotic patients as once thought Presence of ulcer is not suspected because patients with major psychoses do not often complain about symptoms such as those produced by ulcer and uncommunicative psychotics may even go through acute ulcer perforation without evidencing any distress It is known that schizophrenics are considerably more susceptible to ulcer than manic depressives When a psychosis is associated with ulcer there is a tendency for both diseases to become active at the same time It is interesting to note that chronic ulcer may appear for the first time following bilateral prefrontal lobotomy On the other hand interruption of the communications between hypothalamus and the prefrontal brain by procaine infiltration regularly produces immediate relief of ulcer pain This technic has recently been used rather extensively for definitive ulcer treatment in France

The influence of pregnancy over ulcer has special clinical significance An active ulcer rarely is diagnosed for the first time during pregnancy One can almost always predict that a spell of pregnancy will have a salubrious effect on an extant ulcer This is only a striking tendency however and occasionally one encounters a fresh rapidly enlarging ulcer in a pregnant woman Both hemorrhage and perforation may occur but are rare

ETIOLOGIC CONSIDERATIONS

Ulcer etiology begins centrally As has just been indicated certain psychovisceral influences exert their behind the scenes control over selection of candidates for the process It is well established that both hormonal and nervous mechanisms are responsible for mediation of the central stimulus The pituitary adrenal axis seems to be primarily involved in the former and the cerebral vagal axis in the latter There is a tremendously interesting and important literature on these matters and this should be familiar to the gastroenterologist The main problem now is to define the final common pathway through which these undoubted influences come together to effect ulceration The acid peptic theory which stimulated a century of concentrated study and enthusiasm is faltering One can only admire the determination of its proponents in the face of results which have paid off only in serendibitous data

To explain the local mechanism which leads to ulcer formation a theory must recognize such features or facts as the usual localizations of ulcer the discreteness of ulcer failure of the whole stomach and duodenum to become one big ulcer the rarity of gastric ulcer in the area where gastric juice usually rests against the wall the frequency of ulcer in the relatively dry areas the usual depression and at times absence of acid secretion in gastric ulcer etc The normal gastrointestinal tract is of course immune to autodigestion and so the keystone for a proper theory of ulcer genesis must lie in identification of the factor or mechanism responsible for localized depression of mucosal resistance Furthermore depression of mucosal resistance must be explained on the basis of a misdirected physiologic activity not on the presence of pathologic change and the mechanism must be readily available to any gastroduodenum All superficial loss of tissue elsewhere in the body whether the underlying disease be infectious traumatic thermal or neoplastic is due to ischemia or at least hypoxia of the surface tissues It was believed more than a century ago that gastroduodenal ulcers too must be due to ischemia but at that time anatomic understanding of the gastroduodenal wall did not permit the scholars to envision a mechanism which could explain local ischemia

As the anatomy and physiologic significance of the arteriovenous shunt system which is widespread throughout the organs of the body have become elucidated it has been thought that here might be the missing explanation for humorally and nervously controllable local hypoxia in the upper gastro-

intestinal tract The gastric and duodenal arteries make rich anastomoses on either side of the muscularis mucosae Arteriovenous shunts are disposed along branches of the mucosal arteries before or just after they pierce the muscularis mucosae and junction is established with mucosal and submucosal veins When open the shunts have a maximum diameter of about 140 micra They become closed when the encircling layer of musculoepithelial cells of Clara suddenly imbibe fluid and swell There appears to be no muscular activity in the shunt walls The shunts of the gastroduodenal wall sometimes seem to open and close in concert causing the striking mucosal blanching and plethora which have been described during emotional stress in patients with a permanent gastrostomy But shunts are either open or closed and the amount of blood which is sidetracked depends on the number in operation not their diameter Because all variations in the blood volume of the total mucosa are *encountered experimentally it seems* clear that at any moment some shunts are open and others are closed When a shunt opens the finer vascular network of the regional mucosa becomes nearly empty The mechanism then can by its inherent activity account for focal mucosal hypoxia and possibly spontaneous devitalization Open shunts can regularly be demonstrated close to ulcers *in human material*

The vasomotor control of the gastroduodenum is under the direct influence of the hypothalamus as are its motility and the quantity and quality of its secretions It is known that the shunting system is controlled by both humoral and autonomic stimuli Both are called into play in stress situations *Shunts are opened by epinephrine* and variably affected by histamine One of the most important functions of the latter drug on the stomach is that exerted directly on its vasculature although the secretory effects have received most of the publicity Pitressin in large doses depresses secretory activity causes arteriolar and capillary spasm in the mucosa and also produces ulcers even when the vagus nerves have been cut

So far the native gastroduodenal arteriovenous shunt system and its physiologic dysfunctions seem to answer best the many questions regarding the final common pathway in ulcer genesis It may well be that an excessively efficient shunting mechanism is merely one of the stigmas of the ulcer patient one which unlike his high arch palate and narrow subcostal angle incidentally causes the little lesion to form Once tissue devitalization has been produced acid peptic activity *seems to help in cleaning away* the superficial tissue

LOCAL PATHOLOGY

Duodenal ulcers are believed to develop rather quickly attaining full size in perhaps only two or three weeks Unlike gastric ulcers which tend to retain their original degree of acuteness or chronicity most duodenal ulcers appear to act as acute lesions at the outset and then to become chronic in their activities *At the end of two or three* weeks the great majority are no larger than 0 5 cm in diameter Rather than growing further they then wax and wane with successive periods of partial healing and breakdown As a result chronic inflammatory reaction and fibrosis are constantly stimulated in the base and environs Only rarely does one encounter a giant ulcer in the duodenum and a lesion larger than 0 5 cm is unusual however old it may be

The location of the lesion governs to a considerable degree its behavior Ninety per cent occur within the bulb Any surface of the bulb may be involved without notable preferences In about 20 per cent of cases there is more than one ulcer per bulb and *of course it is not uncommon* for there to be also an ulcer in the stomach When two ulcers lie in apposition on opposite walls they are sometimes referred to as kissing ulcers Ulcers on the anterior wall of the bulb tend to stimulate relatively little fibrosis and it is almost exclusi*vely the lesion in* this position which is able to heal without leaving gross scar or other evidence of its

former activity When true acute ulcers de velop in the duodenal bulb they develop in the anterior wall and the majority of perforations occur anteriorly This appears to be due simply to the lack of restraining in fluences

Posterior wall bulbar ulcers are charac terized by more scarring They are then much more likely to cause cicatricial ob- slowly with the formation of gas pockets or abscesses Rarely giant sinus tracts de velop with a diameter which may exceed that of the contracted bulb The posterior penetrating ulcer is responsible for most cases of ulcer hemorrhage It erodes into the side of any artery it encounters and quickly severs it Thus there are two bleeding arteries at the base of hemorrhaging ulcers

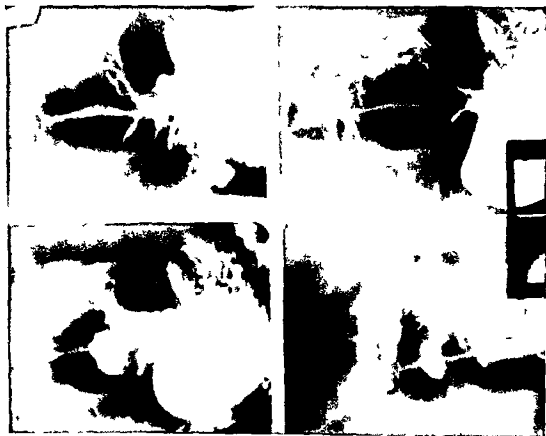


FIG 83 Chronic ulcer of bulb with pseudodiverticulum formation The picture changes rapidly with the phase of bulbar filling

struction With scarring and relative obstruc tion two types of pouch may form proximal to the ulcer site Pseudodiverticula may be forced out by intraluminal pressure and fibrous bands may form small complex pockets as they contract These are important for roentgenologic interpretation (Fig 83) Posterior wall ulcers occasionally perforate acutely into the lesser peritoneal sac but they are much more likely to penetrate

About 10 per cent of duodenal ulcers de velop in the second portion of the duodenum usually just beyond the bulb These are the postbulbar ulcers Eighty per cent are located on the posterior wall and in about 20 per cent of the cases there is an associated ulcer within the bulb There is a great preponder ance of men among patients with postbulbar ulcer The important pathologic consequence is penetration into the superior pancreatico

duodenal artery with severe hemorrhage Approximately 60 per cent of patients with postbulbar ulcer either come to medical attention because of hemorrhage or give a history of important hemorrhage A much less common event is obstruction of the common or pancreatic duct by the fibrosis of repeated healing and reactivation

CLINICAL PICTURE OF UNCOMPLICATED ULCER

The symptoms of duodenal ulcer are due to upper gastrointestinal neuromuscular dysfunction sparked by the irritation of the local lesion They are most variable and as pointed out in the preceding chapter it is not at all unusual to discover an ulcer by accident in a person who has never had any gastrointestinal troubles As a general rule duodenal ulcers are less likely to remain silent than gastric ulcers Some ulcers never cause a symptom until they perforate or hemorrhage Most observers report that periods of seasonal change tend to cause ulcers to become symptomatically active but others can find no important tendency along these lines The geographic origin of the reports does not explain the discrepancies The statistical significance perhaps remains questionable but the clinical fact is that a good many ulcer patients in the temperate climes on either side of the equator find the spring and fall to be especially hard for them

The main subjective manifestation of the neuromuscular dysfunction is pain In spite of classical teachings it is a mistake to expect that the majority of patients will recite a history of hunger pain and relief with alkali If one uses roentgenologic examination as the diagnostic baseline and if one is in the habit of making an upper gastrointestinal x ray study in most cases of dyspepsia he finds that only about one quarter of duodenal ulcer patients give this classic history of their symptoms Although the pain of uncomplicated ulcer is always periodic it is not necessarily rhythmic Only when it is clearly rhythmic may it be the familiar one of burning or gnawing epigastric pain building up about two hours after meals with relief that can always be predicted with confidence if something is put into the stomach In addition to alkaline material and any kind of food relief is often afforded by a glass of water barium suspension a highball and even dilute acid solution Most patients find milk ideal Whether or not the patient gives a clear cut story like this there is often early morning pain waking him about two hours after midnight Nocturnal pain coming on the same time every night or some nights is likely to be the most precise feature of the history It is an important point in differentiating gastroduodenal dyskinesia which is due to an irritating focus such as ulcer from gastroduodenal dyskinesia which is secondary to central emotional disturbances During sleep the emotions are obtunded much more than are the reflex muscular reactions to focal irritation

Unless there has been penetration the pain of ulcer ordinarily remains localized to a small area in the midline at the level of the lesion This is true visceral pain and although in some patients it may be felt up in the chest and in others it is largely hypogastric it remains close to the midline It rarely becomes severe unless there has been penetration or perforation and it is more likely to be vague than one would guess from classical descriptions In postbulbar ulcer particularly pain is a rather minor clinical consideration Posterior wall ulcers do not seem to produce back pain unless there is penetration

Complex dyspepsia is more characteristic among ulcer complaints than is the hunger pain food relief cycle Many many periodic combinations are encountered some with rhythmicity and some without The commonest elements are pyrosis epigastric feelings of gas pressure quick filling at meals nausea belching regurgitation and weak feelings in the abdomen Rather often the first manifestation is vomiting in the absence of any obstructive element and occasional vomiting through the course is very common There

are the symptoms of colon irritability in about one third of the patients often correlat ing rather well in its severity with ulcer activity Diarrhea and constipation are equally common the latter often appearing just prior to a recurrence

Well localized epigastric tenderness is the only physical sign of the lesion itself The degree of tenderness found by palpation

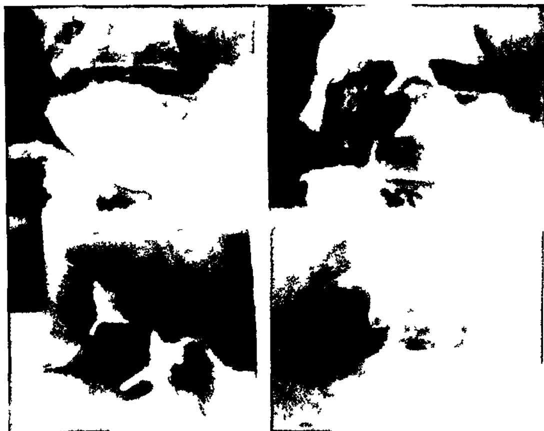


FIG 84 Double ulcers of bulb with considerable cicatricial reaction The deformity pro duced is characteristic

does not necessarily give information as to whether a crater is active or healing or healed in many instances Interpretation of *epigastric tenderness is very difficult* Few normal people can tolerate deep pressure over the upper midabdomen without evinc ing considerable discomfort To state that ulcer patients have tenderness is to give meager information The physical signs of nervousness or emotional instability are common particularly bitten fingernails and tattooings

DIAGNOSIS OF UNCOMPLICATED ULCER

To the radiologist belongs the respon sibility for diagnosis of the duodenal lesion To the clinician belongs the responsibility of evaluating the whole disease As stated earlier in this section detection of the crater does not tell one a great deal in addition about the patient because it appears to be a mani festation rather than the disease There is a *big gap between the patient s illness* and the results of objective study Nevertheless it is of course important to know whether the duodenum is ulcerated because of the po- tential complications

Clinical recognition of *the presence of a* duodenal ulcer is very difficult The mis

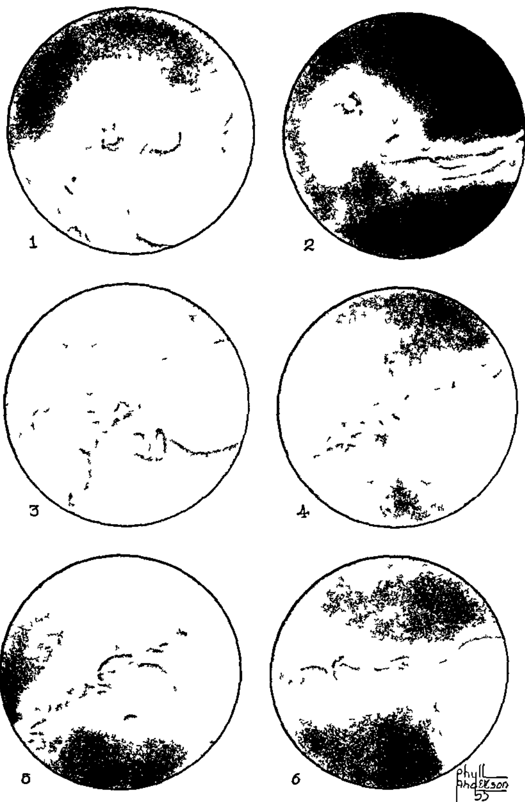


FIG 85 Some characteristic bulb deformities in duodenal ulcer as they present themselves to the radiologist Drawings from compression spot films A crater can be seen in only the first three

conception that diagnosis is easy was born and propagated before the roentgenologists began checking the clinician s impression It was even taught that from the history and physical findings one can tell on which side of the pylorus an ulcer lies and whether the anterior or posterior wall is involved The clinician who believes that the history will tell whether or not a patient has an ulcer invariable even in the case of chronic ulcer with many exacerbations and healings The characteristic ulcer deformity combines the features of narrowing and irregularity of outline which are partially cicatricial and partly spastic plus the presence of diverticular outpouchings proximal to any narrowed area Sometimes however radiating folds are the only indication of the presence of an ulcer

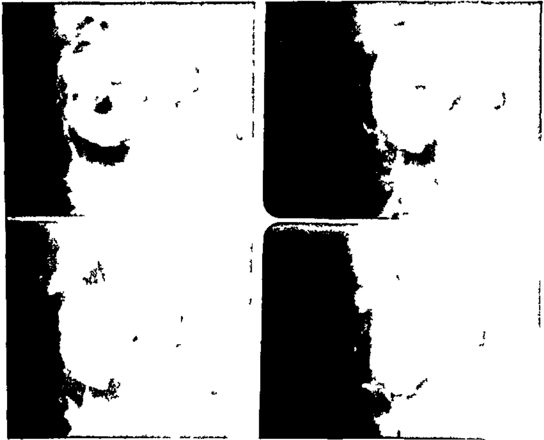


Fig 86 Not all ulcers cause deformity of the bulb Without compression technic this large crater would not have been seen

will find that his diagnostic accuracy is very poor if he checks it against the radiologist s findings

Roentgenologic diagnosis depends on demonstration of a crater or of the characteristic deformity which is produced by ulcer healing (Fig 85) The great majority of all bulbar deformities are secondary to ulcer healing It is important to understand however that bulbar deformity is by no means

A true clover leaf deformity is an unusual finding although it can be regarded as diagnostic It is produced by symmetrical pseudodiverticulum development Eccentricity of the pylorus is a more common finding Less direct but frequent roentgen signs are pylorospasm antral irregularity and irritability hypersecretion gastric hyperperistalsis and gastric stasis

Relief studies with compression over the

area are essential for evaluation of the bulb (Fig 86) In cases in which local spastic deformities confuse interpretation a remarkable degree of help is often afforded by administering 10 mg of morphine intravenously about 10 minutes prior to fluoroscopy An entirely different picture is then often found and a crater which previously was not even suspected sometimes becomes easily visualized The right lateral position is usually most useful for fluoroscopic study because the posterior bend of the duodenum introduces overlapping in the anteroposterior projection

Once an ulcer has been identified there is little to be gained by repeating roentgenologic study during or following therapy unless a complication is suspected It does not matter very much to the patient s illness whether his ulcer is active or healed An ulcer crater comes and goes too quickly to be useful as a guide to clinical progress or to prognosis An ulcer which is found to be healed today may be active tomorrow Much more can be learned about the effectiveness of treatment and the patient s progress by talking to the patient than by repeating his x ray study

TREATMENT OF UNCOMPLICATED ULCER

In the treatment of uncomplicated duodenal ulcer it is found that the emotional aspect of comprehensive gastroenterology is tremendously more important than the organic There are a thousand good ways to treat the ulcer lesion itself Hospitalization with diets and antacids and antispasmodics and sedatives will almost always cause an ulcer crater to heal By itself it will not help the whole illness very much It is doubtful that any of the ministrations other than the hospitalization have anything to do with the good result and this is largely because of the emotional support it offers In the majority of patients who are hospitalized with the understanding that experimental management is to be carried out for evaluation of a new antiulcer drug it is impossible to keep the ulcer from healing whatever the drug might be Patients who are treated with relatively large doses of hydrochloric acid at frequent intervals for instance almost always do extremely well both clinically and roentgenologically

But to reiterate the little lesion in the patient s duodenum is not his problem Treatment must be directed at the whole patient Anything else gives only the most temporary result The temporizing measures of diet and drugs for the rest of a patient s life are not a very good solution for his problem Psychovisceral understandings have advanced far enough so that it is possible to do much more for him It is not necessary that the habit of recurring continue to be the chief characteristic of duodenal ulcer The time has come in ulcer therapy for more philosophy and less technology

When uncomplicated the ulcer itself requires little special attention In particular there is no virtue in dietary treatment Whatever the stage of the ulcer if it is not complicated by active hemorrhage or obstruction it makes out best on a full or normal diet There should be no restrictions On the other hand the patient should not be urged to eat everything if he has genuine idiosyncrasies to certain items The nature of his food should be presented to the patient as wholly unimportant to his problem Similarly use of coffee alcohol and tobacco is unrelated to ulcer genesis and ulcer healing and use in normal moderation need not be restricted

There is no permanent or long range help to be obtained from medications and ordinarily none need be prescribed Especially it is important to avoid suggesting to the patient that it is possible for pharmacologic gestures to furnish any sort of a cure for his physiologic disturbances If it appears desirable early in the course of treatment to offer the patient stopgap symptomatic help he may be given aluminum hydroxide to be used when he feels a need for it

For permanent help and even hope of cure the gastroenterologist must concentrate realistically on the patient s emotional problems through interview therapy as mentioned in the

first chapter The permanency of results or cure aspect is emphasized because the classical therapeutic approach with diet and medicines is more superficial and restricted in its goals being aimed simply at submerging the ulcer and its symptoms and repressing its tendency to recur The purpose of current treatment is to permit the patient to communicate to the physician what is making him sick through goal directed interview The patient is permitted to accept the responsibility for understanding his own illness In all doctor patient dealings the ulcer itself is de emphasized The patient finds he is not expected to surrender the individuality of his own special problems to the automatism of a regimented or standardized hospital or clinic routine The patient finds he is being treated as an individual He recognizes a new degree of sincerity in this set up through finding perhaps for the first time that the things he has on his mind are automatically accepted as important The doctor becomes tremendously important to the patient but not because he grasps full responsibility for the illness and its treatment The doctor offers only as much support as the patient wants After the interviews get under way the patient almost always seems to forget about his abdominal complaints in favor of his emotional problems and seldom mentions them spontaneously again

The difficulties encountered in this approach to ulcer disease are created to a large extent by the patient s past training and his reading on digestive disorders Initially he shows uncertainty and confusion over just what his treatment is consisting of because no concrete course of therapy is outlined for him The emotionally sick person often anticipates problems when he is placed in a flexible situation and he requires help in adapting to the philosophy of treatment Frequently it is difficult for the patient to make the initial step in finding out for himself that special diets contribute nothing to his well being The dietary cripple is not easily weaned to a full diet The supposed magic of milk as a sort of creed preoccupies the dietary thinking of many patients It is necessary to destroy the monster of dietary invalidism and to give special support to those who have been trapped into the further invalidism of forced pharmacotherapeusis

Active interview treatment is terminated when the patient indicates that he desires it Perhaps on an average 10 hours of interviewing have been completed by the time this point is reached It has been carried out at whatever intervals have been convenient—possibly one to three times a week The way is left open by the doctor for further interviews whenever the patient feels the need Meanwhile he is given no prescriptions and no restrictions are imposed

THE COMPLICATIONS OF DUODENAL ULCER

Development of complications makes an entirely different disease of duodenal ulcer Organic thinking must of necessity dominate the approach although not to the exclusion of the principles of comprehensive management The same central factors which cause ulcer cause ulcer complications The complication rate rises significantly among populations subjected to frustrating stress as during aerial bombing In individual patients it is common to find that some inordinately difficult emotional problem presented itself shortly before hemorrhage or perforation Prophylaxis then is best carried out by meeting emotional threats as they arise It is effective but to what extent is not yet known

It is very difficult to know how frequently complications occur or can be expected because often the ulcer patient does not report to a doctor until one develops Hospital statistics are greatly weighted on the side of complications There are convincing figures to show that in this country the proportion of complications among Negroes as compared to Caucasians has been increasing rapidly for the past 50 years

Women have the same complications as do men but among them the incidence of perforation is considerably lower and that of obstruction a little higher Women are as

likely as men to hemorrhage from duodenal ulcer Usually pregnancy helps all ulcer manifestations a great deal but neither hemorrhage nor perforation is unknown in the pregnant woman Parenthetically a woman s ulcer is much more likely to be complicated by co existent gallbladder disease than is a man s

Ulcers of infants are notoriously prone to perforate and to hemorrhage As has been mentioned many of these lesions are Cushing ulcers The ulcer in this group is chiefly destructive with absence of inflammatory or fibroblastic activity—all injury and no repair Characteristically the clinical onset is sudden development is rapid and the end often swift The babies are often marasmic and usually premature to begin with and the mortality rate is very high The surgical mortality among neonates who require operation for perforation or hemorrhage is about 80 per cent Among infants from 15 days to 12 months of age it is approximately 60 per cent

HEMORRHAGE

The general subject of gastrointestinal hemorrhage warrants a separate chapter but there are a few specific duodenal ulcer matters which require separate discussion here Approximately one quarter of patients with duodenal ulcer at some time have grossly recognizable bleeding Bleeding is the first evidence of ulcer in about 15 per cent of patients From series to series the mortality rate is reported as from 5 to 10 per cent but in noting the figures one must remember that there are many ways of categorizing hemorrhage and of constituting a patient group The mortality among women patients is slightly lower than among men The rate rises considerably with patient age In some parts of the world the risk of hemorrhage seems greatest in spring and fall

Postbulbar ulcers are more likely to bleed than are bulbar ulcers and those of the posterior wall are especially susceptible It may be noted that among all types of ulcers of the upper gastrointestinal tract jejunal anastomotic ulcers carry the greatest risk of hemorrhage Hemorrhage from gastric ulcer is attended by a mortality rate which is twice that of bulbar ulcer Statistically it appears that patients who have had one ulcer hemorrhage have about twice the chance of having another as do comparable patients who have never bled wherever the ulcer is located The first hemorrhage is usually the most severe and the mortality rate among first bleeders is higher than that among second or third bleeders in spite of increasing age Certain drugs



Fig 87 Ulcer which had led to gastrectomy because of hemorrhage A large segment of artery at its base has been eroded away Two open artery ends are thus exposed

seem to upset the expectancies in a portion of patients by artificially encouraging hemorrhage examples being the steroid hormones hydralazine and hexamethonium the salicylates and phenylbutazone

Usually ulcer bleeding is episodic beginning suddenly and usually stopping spontaneously Chronic continuous blood leakage is unusual This is arterial bleeding and it is due to erosion into the side of an artery which runs across the base Because of the regional arterial anastomoses two bleeding points are created (Fig 87) Spontaneous cessation seems to depend on prograde invagination of the arterial intima into the open

arterial end rather than to arterial spasm or simply to clotting

Treatment of massive hemorrhage from ulcer particularly use of emergency surgical measures requires careful patient individualization A proper decision regarding operation can be rendered only if there is the closest cooperation between gastroenterologist and general surgeon Much depends on the patient s history regarding hemorrhage in the past and on his physiologic response to the current episode One s criteria for falling back on radical measures are more strict than they can be in the more dangerous case of hemorrhage from gastric ulcer The operation of choice is subtotal gastrectomy and if it is at all possible the ulcer crater must be removed Usually the surgeon will stop the hemorrhage via duodenostomy first so that resection can be sufficiently meticulous When hemorrhage accompanies acute perforation either emergency gastrectomy or simple closure with isolation and ligation of the bleeding points is in order

The general indications for surgical intervention for hemorrhage to be tempered by individual considerations are these When there is torrential hemorrhage and immediate rapid transfusion of 2500 ml of blood does not improve the patient s clinical condition or hemodynamic signs it is seldom wise to postpone operation Whenever there is continuous hemorrhage which requires replacement of more than 1500 ml per day for several days in order to maintain hemodynamics one can properly conclude that conservative measures are insufficient There is probably little to be gained by waiting more than five days Some surgeons believe that a two day trial is long enough but if it is not difficult to keep up with the hemorrhage and blood supplies are sufficient one might be a little more conservative Recurrence of hemorrhage within a day or two of initial cessation is a serious sign indicating ineffectiveness of the native arterial plugging devices It is usually wise to operate at the beginning of a recurrence even when it does not seem particularly threatening if the initial hemorrhage was severe

Finally if a patient is known to have had two or more severe hemorrhages in the past it may well be decided that the current hemorrhage even though not of severe degree completes the criteria for proceeding with more definitive therapy Operation would be then largely a prophylactic move It ordinarily is postponed until after bleeding has ceased and the patient has reached optimum condition for gastrectomy The patient s age should not be considered a matter of great importance among indications for interim surgical prophylaxis There are too many individual variables to permit blanket policies on these matters The patient who has had two important hemorrhages before the age of 25 years may often be considered to have as urgent a need for prophylactic gastrectomy as has the patient of 50 years who has the same history Similarly the type of medical treatment which the patient has received since the time of his first bleeding episode should not have a great bearing on the decision to operate Unfortunately an ulcer which has been kept under excellent control with what appears to have been firm healing for many months may quickly break down and hemorrhage under conditions of sudden emotional stress If the patient has had no ulcer talk or other attention since his first hemorrhage he will certainly benefit from it but it cannot be counted upon to prevent hemorrhage in the future

PENETRATION

When a posterior wall bulbar ulcer penetrates out into surrounding tissues it usually enters the substance of the pancreas Less commonly it enters the tissues about the common bile duct Common duct obstruction may result Postbulbar ulcers rarely penetrate but if they do they are likely to enter the retroperitoneal space producing a confusing clinical picture which is often accompanied by widespread emphysema This is the common explanation for the roentgen finding of extravasated air in the retroperitoneal tissues

The symptomatic picture changes considerably when an ulcer penetrates posteriorly All symptoms become more severe There is often persistent vomiting and a previously good appetite may suddenly decline The pain pattern becomes distorted Relief upon eating is entirely inadequate It is not unusual for periods of relief to disappear entirely and *continuous day and night pain* may supervene Location and radiation patterns of the pain change too Simple uncomplicated ulcer pain is visceral pain and is thus referred to the midline anteriorly With penetration it becomes parietal pain referred to the anatomic location of the lesion and to the involved peritoneal surfaces Because duodenal ulcers lie close to the midline there is almost no shift in the lateral distribution but there are changes in the two other directions The mesocolon is often invaded and then there is referral to the hypogastrium Excavation of the pancreas causes boring pain radiating straight through to the back As with all types of pancreatic pain the patient finds himself depending on postural maneuvers in his search for relief Similarly the mysterious pancreatic cerebral axis seems to be activated for new psychiatric manifestations often appear

Diagnosis depends on clinical evaluation of these clinical manifestations The depth of the crater as it is measured roentgenologically may be quite misleading

It is an unusual instance of penetration *which responds satisfactorily in a long term* sense to any but surgical measures Penetration can almost always be considered an indication for subtotal gastrectomy Vagotomy with gastroenterostomy is not a good procedure for this complication

PERFORATION

Perforations into the peritoneal cavity show a wide range of seriousness depending on the size of the hole and the amount and suddenness of peritoneal spill Some are very small leakage is slight and spontaneous closure quickly follows Others transgress the duodenal wall slowly and incite enough peritoneal reaction in so doing that upon perforating they find themselves well walled off This is the forme frustre type of perforation commonly unnoticed clinically and discovered by surprise roentgenologically or at operation Such walled off perforations often seem to be quite chronic at the time they are detected Upon x ray study they appear as large pseu*dodiverticula* which imbibe barium suspension readily Sometimes only isolated pockets of trapped air which cannot be replaced with contrast medium are found close to the bulb This latter sign sometimes permits one to suspect the diagnosis from a plain film of the abdomen

The usual perforation is free and the resulting clinical episode calamitous It is a common complication in the male ulcer patient It behaves in a most haphazard fashion affording little opportunity for prophylaxis or even prediction The accident may occur when the stomach is empty or full during sleep or during heavy physical activity Rather often perforation is the first evidence that an ulcer exists There appears to be no special perforation season during the year Approximately 20 per cent of patients who have a perforation give a history of hemorrhage in the past

The pain of free perforation is sudden and quickly spreads over all of the upper abdomen Occasionally the patient if upright immediately faints Sudden pain of abdominal origin producing syncope in a man is most *likely due to ulcer perforation* Always he finds it necessary to lie down supine flat and perfectly quiet Initially he may retch or vomit a few times In spite of the catastrophic picture the pulse and blood pressure are not altered at first The abdomen immediately becomes hard as a board and tender as a boil As time wears on if surgery is not carried out the acute local manifestations subside to some extent After a few hours the pain sometimes largely clears the abdomen becomes rather soft and tenderness is obtunded Systemic manifestations however become more striking with tachycardia respiratory distress leukocytosis and perhaps

all the stigmas of shock

Commonly the perforation closes off spontaneously to halt further soiling If the patient does not die soon after the acute phase the widespread chemical peritonitis gradually becomes loculated as scattered abscesses by peritoneal and omental reaction At some stage in the course of events bacterial infection becomes established through the inflamed tissues The largest collections of pus usually develop in the pelvis midabdomen and right subphrenic space Spontaneous recovery from the acute peritonitis of perforation seldom is possible after this stage has been reached The problem of postperforation abscess is no longer so much one of neglected therapy as it is of drug subdued local signs of infection Because of routine use of antimicrobial drugs such serious complications as subphrenic abscess may get a good start before anyone becomes aware of their presence

Diagnosis is almost entirely a clinical one Because all degrees of spill and spontaneous localization are encountered the clinical diagnosis is often difficult This is only one of a great variety of acute catastrophic events which may occur in the upper abdomen The diagnosis of perforation often can be confirmed by roentgenologic demonstration of free air in the peritoneal cavity although this does not of course give information as to the site or cause of perforation (Fig 88) Reported figures vary considerably as to the success of x ray examination in showing air Perhaps it can be expected to do so in 80 per cent of cases provided the patient is prepared correctly for the study Much depends on the amount of air present and on its freedom to move about in the peritoneal cavity It is said that as little as 5 ml in the right subphrenic space can at times be demonstrated However in the unusual instance in which there has been posterior perforation into the lesser sac a great deal of air may pass undetected until it has moved out into the greater sac Films may be taken with the patient in the upright position so air will collect under the diaphragm (Fig 88) or in one or the other lateral position There are varying preferences in this regard The most important point is that the patient be placed in the position for filming at least 20 minutes prior to the time the films are actually taken Unless this is done air will not rise in many cases and the results of examination will be misleading

Treatment is immediate surgical closure of the perforation and peritoneal toilet with antimicrobial and the usual supportive measures provided the peritonitis is no more than about six hours old Mortality attending surgical treatment increases rather rapidly with the time lapse which follows perforation After six hours local peritoneal and omental reaction has progressed to an extent which largely defeats surgical efforts to clean the abdominal cavity and closure of the duodenal hole has already spontaneously occurred The patient who is received too late to permit emergency surgical treatment is managed by antimicrobial fluid electrolyte and blood transfusion measures until firm localization of intra abdominal abscesses permits their surgical drainage if it becomes necessary

Following emergency surgical closure approximately 20 per cent of patients require additional surgical treatment perhaps half because of obstruction at the ulcer site This has encouraged some surgeons to carry out emergency definitive subtotal gastrectomy immediately following acute perforation Although this approach has some advocates the more conservative procedure seems at the moment much the more desirable It is a remarkable thing that when a patient has more than one gastroduodenal ulcer the perforation of one is often accompanied by synchronous perforation of the other or others For this reason it is particularly important that the surgeon explore the region carefully for signs of a second perforation

Nonoperative treatment of acute ulcer perforation is an approach born of necessity during World War II when surgical help was insufficient in certain regions It has been continued in some centers as a satisfactory

The symptomatic picture changes considerably when an ulcer penetrates posteriorly All symptoms become more severe There is often persistent vomiting and a previously good appetite may suddenly decline The pain pattern becomes distorted Relief upon eating is entirely inadequate It is not unusual for periods of relief to disappear entirely and continuous day and night pain may supervene *Location and radiation patterns of the pain change too* Simple uncomplicated ulcer pain is visceral pain and is thus referred to the midline anteriorly With penetration it becomes parietal pain referred to the anatomic location of the lesion and to the involved peritoneal surfaces Because duodenal ulcers lie close to the midline there is almost no shift in the lateral distribution but there are changes in the two other directions The mesocolon is often invaded and then there is referral to the hypogastrium Excavation of the pancreas causes boring pain radiating straight through to the back As with all *types of pancreatic pain the patient finds him*self depending on postural maneuvers in his search for relief Similarly the mysterious pancreatic cerebral axis seems to be activated for new psychiatric manifestations often appear

Diagnosis depends on clinical evaluation of these clinical manifestations The depth of the crater as it is measured roentgenologically may be quite misleading

It is an unusual instance of penetration which responds satisfactorily in a long term sense to any but surgical measures Penetration can almost always be considered an indication for subtotal gastrectomy Vagotomy with gastroenterostomy is not a good procedure for this complication

PERFORATION

Perforations into the peritoneal cavity show a wide range of seriousness depending on the size of the hole and the amount and suddenness of peritoneal spill Some are very small leakage is slight and spontaneous closure quickly follows Others transgress the duodenal wall slowly and incite enough peritoneal reaction in so doing that upon perforating they find themselves well walled off This is the forme frustre type of perforation commonly unnoticed clinically and discovered by surprise roentgenologically or at operation Such walled off perforations often seem to be quite chronic at the time they are detected Upon x ray study they appear as large pseudodiverticula which imbibe barium suspension readily Sometimes only isolated pockets of trapped air which cannot be replaced with contrast medium are found close to the bulb This latter sign sometimes permits one to suspect the diagnosis from a plain film of the abdomen

The usual perforation is free and the resulting clinical episode calamitous It is a common complication in the male ulcer patient It behaves in a most haphazard fashion affording little opportunity for prophylaxis or even prediction The accident may occur when the stomach is empty or full during sleep or during heavy physical activity Rather *often perforation is the first* evidence that an ulcer exists There appears to be no special perforation season during the year Approximately 20 per cent of patients who have a perforation give a history of hemorrhage in the past

The pain of free perforation is sudden and quickly spreads over all of the upper abdomen Occasionally the patient if upright immediately faints Sudden pain of abdominal origin producing syncope in a man is most likely due to ulcer perforation Always he finds it necessary to lie down supine flat and perfectly quiet Initially he may retch or vomit a few times In spite of the catastrophic picture the pulse and *blood pressure are not* altered at first The abdomen immediately becomes hard as a board and tender as a boil As time wears on if surgery is not carried out the acute local manifestations subside to some extent After a few hours the pain sometimes largely clears the abdomen becomes rather soft and tenderness is obtunded Systemic manifestations however become more striking with tachycardia respiratory distress leukocytosis and perhaps

telligent fluid and electrolyte replacement gestures towards parenteral nutritional help prophylaxis against pulmonary complications and assistance for the patient s emotional needs

OBSTRUCTION

The duodenal ulcer patient is susceptible to two types of obstruction at the pylorus or just within the duodenal bulb temporary noncicatricial obstruction and progressive cicatricial obstruction The former is more common and probably develops to a sub clinical degree from time to time in most ulcer patients Its basis seems to be a com bination of edema and spasm Both are in dications of ulcer activity and both are re versible They may be prominent among the initial manifestations of ulcer or may super vene at any point in the course of a chronic lesion This type of obstruction may sud denly aggravate partial cicatricial obstruc tion Clinically the manifestations are those of a rather acute process with nausea vomit ing and a feeling of heavy discomfort in the upper abdomen The stomach maintains its tone and works hard to empty either upwards or downwards Perhaps for this reason clapo tage cannot often be elicited Roentgenologi cally hyperactivity of the stomach retention and narrowing or closure at the pyloric area are found Treatment simply involves con stant gastric aspiration and sedation for about four days with attention to fluid and elec trolyte needs It almost always leads to quick eradication of the obstructive process al though recurrence after weeks or months have passed is common If treatment is un successful cicatricial obstruction must be sus pected

Cicatricial obstruction is quite a different matter This is a complication of old ulcers usually those which have recurred and healed over and over again It is a consequence of the healing process and may develop long after an ulcer has apparently healed for good Obstruction progresses slowly The stomach gradually enlarges with loss of its tone The patient at times does not become aware of the change until the organ has be come huge More often progressively fre quent vomiting and upper abdominal cramps give the condition away Vomiting does not always occur and in such cases it can only be assumed that the stomach is able to en large fast enough however gradual this may be to accommodate the difference between intake and outflow Clapotage can always be demonstrated after the stomach has lost its tone Except for weight loss this is the only physical finding X ray examination shows a dilated stomach with retention There is hyperactivity early and atony later In in stances of partial chronic obstruction useful information may often be obtained regarding the degree and progress of obstruction by emptying the stomach and measuring the volume of its contents every night at bed time for several days The patient can be trained to do this at home if it seems im portant to collect the information over a long period

Surgical therapy is required for cicatricial obstruction Prior to operation it is necessary to deflate the stomach permitting it to regain as much tone as possible This is accomplished by thorough lavage with a large caliber tube followed by constant aspiration for a few days with a narrower tube Sometimes one finds that he has misinterpreted the nature of the obstruction and that preoperative prepara tion has caused the trouble to clear Because of this possibility it is well worth making a second roentgenologic examination routinely following the period of aspiration prior to operation Gastroenterostomy with vagotomy is an ideal operation for cicatricial obstruc tion Subtotal gastrectomy is preferred in some centers but it is doubtful if the late postoperative course is as satisfactory

INTRACTABILITY AND THE PSEUDOSOLUTION OF SURGICAL TREATMENT

Intractability is a difficult complication to define One must be realistic enough to admit that conservative treatment of the duodenal ulcer patient often fails as does surgical treatment and that every ulcer patient is

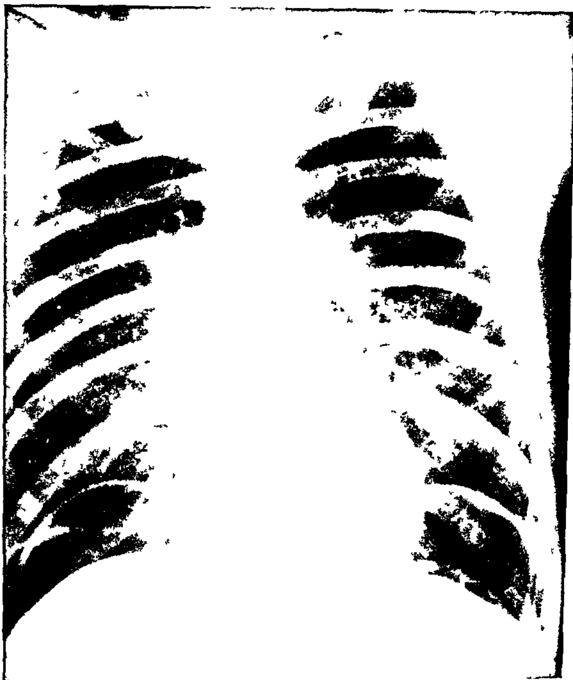


Fig 88 Upright film in case of perforated duodenal ulcer showing subphrenic air collections Not always is one fortunate enough to find such outspoken evidence of perforation

routine way of managing all acute perforations but usually it is reserved either for instances in which the surgically safe postperforation interval has already passed by the time the patient comes to medical attention or for patients who must be treated under conditions in which surgical facilities are not available The method consists of constant gastric aspiration for about five days heavy intravenous antimicrobial coverage and constant meticulous professional attention The last ingredient is the most important and the technic must not be attempted unless a gastroenterologist sympathetic to the approach is in constant attendance to care for such matters as uninterrupted gastric suction in

III Secondary tumors
  A Prolapsed gastric tumors
  B Metastatic or invading tumors

In the duodenum tumors of all pathologic types tend to assume a polypoid form and for this reason roentgenologically demonstrated configurations often are not helpful in separating the benign from the malignant

THE ADENOMAS

Adenomas of Brunner s glands or brunneriomas are the most common tumors of the small bowel but from neither a clinical nor pathologic point of view do they prove to be very important Brunneriomas sometimes occur as well in the pyloric ring and antrum of the stomach and in the second or third portion of the duodenum It is difficult to know the normal limits of the duodenum s brunnerian mass and how much brunnerian hyperplasia one can accept as reasonably normal Brunnerian gland tissue cannot be demonstrated roentgenologically in the normal duodenal bulb and it is thought that



FIG 89 Brunneriomas of the duodenal bulb with the characteristic appearance of multiple sessile polyps

obliged to live a productive life in addition to taking care of his ulcer disease The most important point to consider in managing the complication of intractability is that most patients who do poorly on interview or any other type of medical therapy can be expected to do poorly following surgical therapy For this reason the surgical approach is best reserved exclusively for ulcer patients who develop the urgent complications of dangerous hemorrhage perforation and cicatricial obstruction One is reminded often that intractability refers more accurately to the patient than to his ulcer, yet this concept is sometimes difficult to keep in mind Too often one is tempted to utilize the surgical approach as a last ditch desperate measure in the patient whom nothing else seems to help It is obvious that the factor responsible for medical failure is an unusually difficult emotional or personality problem The patient will have the same problem following operation For intractability a better solution than operation is intensified interview therapy Because the patient who is intractable to drug and surgical approaches often finds himself unable as well to enter into a proper interview relationship with the gastroenterologist he must at times be referred to the psychiatrist

CALCINOSIS AND RENAL INSUFFICIENCY COMPLICATING CLASSIC TREATMENT

A portion of patients who make prolonged use of excessive amounts of milk and absorbable alkali develop calcinosis with renal insufficiency (Burnett s syndrome) The renal lesion consists of calcinosis of the tubular lumina and tubular cells Nephrolithiasis occurs on occasion Often there are ocular lesions band keratitis crescentic deposits of calcium at the corneal margins and conjunctival deposits within the palpebral fissures Other sites which sometimes develop calcinosis are the subcutaneous tissues blood vessels lungs brain periosteum bone muscle tendons and lymph nodes Laboratory study characteristically shows hypercalcemia absence of calciuria often absence of hypophosphatemia normal serum alkaline phosphatase mild alkalosis electrocardiographic abnormalities and varying degrees of renal insufficiency and azotemia If the kidneys have been badly damaged there may be hyperphosphatemia Clearing of the calcinosis and improvement of the clinical disease can be expected in some patients with abstinence therapy Several deaths have been reported At autopsy sometimes parathyroid adenomas are found and there is a question of whether in all cases Burnett s syndrome can be distinguished from hyperparathyroidism

DUODENAL TUMORS

Duodenal tumors are infrequently encountered but the duodenum is nevertheless the most common location for small bowel tumors They are a constant source of worry for the gastroenterologist as one more diagnostic possibility when disease is suspected in the pathologically bountiful upper abdomen Tumors of the duodenum are well hidden from the palpating hand although favorably located for roentgenologic study Because of the general vulnerability of the local structures tumors of the duodenum may cause a lot of local disturbances considering their relatively small size

For purposes of diagnostic thinking it is convenient to classify duodenal tumors as follows

- I Primary benign tumors
  - A The adenomas
    - 1 Simple adenomas
    - 2 Aberrant pancreatic rests
    - 3 Brunneriomas
    - 4 Argentaffinomas
  - B Intramural connective tissue tumors
    - 1 Leiomyomas
    - 2 Fibromas
    - 3 Other types
  - C Cysts
- II Primary malignant tumors
  - A Carcinoma
    - 1 Suprapapillary
    - 2 Peripapillary
    - 3 Infrapapillary
  - B Sarcoma—several possible rare types

diagnosis of the tumor type cannot often be made however and the nature of the lesion ordinarily is not recognized until the resected tumor is examined microscopically A rather certain roentgenologic diagnosis is possible if a central duct leading part way down into the little mass can be demonstrated

Simple adenomas originating from duodenal mucosa are less common Ordinarily they are distinctly polypoid (Fig 90) Sessile adenomas are likely to contain enough fibrous tissue to warrant the term fibroadenoma Either may occur as isolated lesions or in company with polyposis of other portions of the small intestine The papilla of Vater is a favorite site of origin It has been reported that choledocholithiasis is a common companion disease There does not appear to be any tendency toward malignant degeneration

Argentaffinomas (carcinoids), although exceptionally rare are mentioned to bring out the point that the duodenum is one of the sites in which they act as benign tumors

OTHER BENIGN TUMORS

Leiomyomas neurofibromas and lipomas are the benign intramural tumors encountered in the duodenum They are rare Usually they make their presence known through ulceration and hemorrhage

Enteric cysts of the duodenal wall have been reported a few times The common duct may empty into the cyst cavity which in turn then drains into the duodenal lumen

Benign tumors of the gastric antral mucosa or of areas higher in the stomach may be carried through the pylorus into the duodenum by gastric peristalsis This mechanical complication is often the way that such a tumor first calls attention to itself The tumor is usually found to be a fibroadenoma but any type of lesion which is sufficiently mobile may be picked up and moved by peristaltic activity It is an intermittent process and judging from the patient s history one guesses that distention of the stomach by a large meal may cause the tumor to be pulled back into the stomach until it is milked forward again Sometimes the tumor becomes permanently trapped in the duodenal bulb by the pylorus The circumstances in some cases suggest that it may reside here for considerable lengths of time without producing symptoms In other patients an outspoken picture of chronic or variable obstruction is produced Whatever the degree of chronicity may be the tumor at any time can suddenly be forced further down into the duodenum causing invagination of the gastric wall Rarely almost the whole stomach invaginates and undergoes intussusception down into the duodenum The diagnosis of the usual state—simple prolapse of a small polypoid tumor—must be made by roentgenologic study or operation Roentgenologic differentiation of intrinsic polyp of the bulb from prolapsed tumor may be very difficult Surgical therapy is always indicated and ordinarily a partial gastric resection is necessary The results are good

PRIMARY CARCINOMA

The duodenum shows a high degree of refractoriness to primary malignant disease Cancer is found in this organ only about 33 times per 100 000 autopsies In clinical practice the ratio between cancer of the stomach and cancer of the duodenum is found to be approximately 100 to 1 Primary cancer of the bulb is rarest of all being a pathologic curiosity although it is not unusual for gastric carcinoma to cross over into the bulb late in its course Beyond the bulb cancers of the duodenum are usually divided into three groups the suprapapillary (papilla of Vater) which comprise about 25 per cent of all duodenal carcinomas the peripapillary comprising about 65 per cent and the infrapapillary which account for the few remaining It must be pointed out that it is often difficult to decide upon the exact site of origin by the time the anatomic parts become available for study Sometimes the organ of origin itself cannot be determined One might suppose that the position of the cancer in relation to the papilla of Vater would furnish a hint to the clinician as to the portion of the duodenum involved but this is not always so

abnormality is implied when it can But this does not mean that the patient s health is impaired even though it necessitates classification of brunnerian hyperplasia as one of the duodenal adenomas The multiple polypoid areas of radiotranslucency which produce the characteristic roentgenologic sign are encountered once in approximately 40 contrast studies Brunneriomas drain to the surface through multiple tiny ducts so that a duct system can never be demonstrated roentgenologically At autopsy the adenomas are found to be merely smooth hemispheric masses produced by orderly hyperplasia of the glands They do not cause symptoms Their clinical importance lies in the danger of misinterpreting the x ray picture as indicative of important disease (Fig 89)

Aberrant pancreatic rests are most common in those parts of the gastrointestinal tract which lie closest to the pancreas proper About half of them are found in the duodenum and most of these are in the second portion Their occurrence in duodenal diverticula has been mentioned Usually they develop as hemispheric or conical elevations just beneath the mucosa Sometimes there are small groups of acini scattered through the muscularis propria and submucosa all interconnected with functioning ducts and emptying by one or two large ducts on the mucosal surface Islets of Langerhans may be present These are not true neoplasms and they do not enlarge with the passage of time Aberrant pancreatic rests do not often exceed 10 mm in greatest diameter Rarely they become eroded and bleed develop acute local pancreatitis or undergo malignant change Unless they should show some such complication treatment is not indicated A specific operative

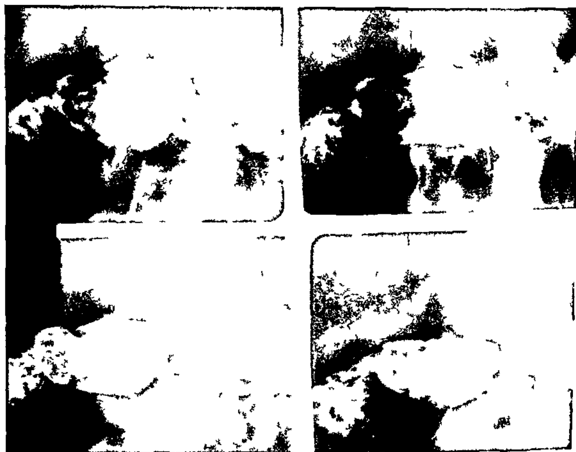


Fig 90 Simple polypoid adenoma originating just distal to the bulb

will not dilate much in response to biliary obstruction Except for liver and gallbladder no abnormalities can be palpated

Laboratory studies show the expected chemical response to obstructive jaundice roentgenologic study in planning therapy (Fig 91) The roentgen signs consist of irregularity in the region of the papilla narrowing of the segment dilatation proximally and translucent areas representing the tumor mass itself Cytologic study of duodenal aspirates may aid diagnosis



Fig 91 Roentgen findings in case of peripapillary carcinoma

Anemia is common and occult melena can be demonstrated in almost all cases If Charcot s fever has developed as a result of obstructive cholangitis there will be leukocytosis

Because primary tumors of the common bile duct and head of the pancreas produce much the same clinical picture as this the clinician must lean heavily on diagnostic

Suprapapillary and infrapapillary carcinomas produce their local manifestations through their tendencies to obstruct the duodenum and to undergo ulceration Late in the course they may obstruct the biliary and pancreatic ducts and they may invade locally with abscess and fistula formation In almost

Carcinoma of the papilla is not invariably accompanied by jaundice nor is the vomitus of the patient with suprapapillary carcinoma always free of bile These are tumors which tend to develop in men more often than women At the time of diagnosis most patients are in the fifth or sixth decade

Most duodenal carcinomas are cylindrical cell adenocarcinomas of mucosal origin Those of the papilla may originate from the mucosa of the papilla itself the ampulla or the common duct s termination Cancers of the proximal portion of the duodenum usually assume either a polypoid form or an ulcerating infiltrating form Those of the papilla are ordinarily papillary in their configuration but ulcerative forms are not uncommon In the infrapapillary position carcinomas show a distinct tendency to infiltrate encircle and ulcerate In all cases metastasis characteristically occurs late in the course Regional nodes are involved first and often metastasis ends here Thus at the time of autopsy distant metastases are found in only about 30 per cent of patients with carcinoma of the papilla and in about 60 per cent of those with infrapapillary carcinoma The usual areas for distant spread are liver and lungs It is distinctly unusual for a cancer of any portion to advertize its presence first through its metastases Similarly centrifugal invasion is slow in comparison with the rate of local growth These behavioral characteristics of the duodenal carcinomas render them biologically favorable for surgical cure if the clinical manifestations plus clinical awareness lead to early search for trouble in the region

Early symptoms are ordinarily vague and unrelated to local effects nonspecific dyspepsias anorexia and tiredness A rather large portion of the patients have diabetes mellitus —an observation the significance of which is not understood—and the early symptoms may easily be ascribed to this When more localized symptoms begin they are likely to develop rather quickly There are important differences according to the tumor s primary location

In the case of *peripapillary carcinoma* one is dealing with a biliary obstructing disease Epigastric or right upper abdominal pain is a regular symptom It is usually accompanied by anorexia nausea postcibal fullness and weight loss Jaundice usually appears within four months of the onset of symptoms and by the time the patient seeks medical help jaundice is ordinarily present The jaundice is not painless as sometimes said and it does not run a constant course Fluctuating jaundice is the rule and occasionally it may clear entirely for a brief period This phenomenon is said to be due to the periodic sloughing of the superficial portions of the tumor permitting bile drainage Pruritis gradually develops and may eventually become severe If obstructive cholangitis supervenes as it eventually does in about one quarter of the cases Charcot s intermittent chills and fever appear Biliary obstruction tends to produce persistent diarrhea

One of the most characteristic features of peripapillary carcinoma is bleeding This is due to surface ulceration possibly aggravated by deficiency in vitamin K absorption Massive hemorrhage is not common but bleeding is often of sufficient quantity and persistence to lead quickly to important hypochromic anemia The terminal event is rarely exsanguination The combination of biliary obstruction and bleeding sometimes causes the stool to take on a strange silver color (silver stool sign of Thomas) About three quarters of untreated patients die of the direct effects of biliary obstruction Death comes within eight months of the appearance of outspoken symptoms in half of the patients who do not receive treatment

Examination of the patient with peripapillary carcinoma however soon he is seen after the onset of localizing symptoms often shows early malnutrition Jaundice is usually present and there may be fever Hepatomegaly is a common finding The gallbladder is often enlarged and palpable Courvoisier s law has stood the test of time rather well Of course chronic cholecystitis confers no immunity to development of peripapillary carcinoma and if there has been cholecystitis the gallbladder

apposition of duodenum and the terminal portion of the common duct Sometimes stones impacted in the common duct erode into the duodenum Such fistulas occasionally are multiple

Duodenobiliary fistulas are sometimes discovered by surprise at upper gastrointestinal roentgenographic study when the contrast medium is seen to back up into the biliary tree or when gas of gastroduodenal origin is discovered in the biliary tract (Rigler's sign) More often there have been obstructive biliary manifestations preceding fistula formation or the patient has presented himself with small bowel obstruction which proves to be gall stone ileus In the case of choledochoduodenal fistula secondary to erosion of a gall stone periodic jaundice often continues due to edema and inflammation about the fistula site Epigastric pain and diarrhea are frequent symptoms It is commonly found that the basic symptomatic pattern is that of the parent disease responsible for the fistula

When duodenal fistulas connect with the stomach jejunum or colon an infiltrating malignant tumor is usually responsible for opening the communication Manifestations depend on the extent to which the fistula shunts duodenal contents and the length of bowel which is by passed Except in the rare instances of gastroduodenocolic fistula however the tract does not seem at all potent as a shunt

Surgical exploration with elimination of the fistula *if that appears to be feasible* is always indicated even though the fistula of itself does not appear to be causing trouble Spontaneous closure sometimes occurs quickly when a migrating gallstone has been at fault but this is likely to be temporary Fistulas secondary to duodenal ulcer are very chronic lesions

EXTERNAL FISTULAS

These are extremely distressing lesions regularly leading to serious debility a difficult therapeutic problem and a high mortality rate Although penetrating injury may be responsible the great majority are secondary to abdominal operation Strangely in some cases the surgery may not have involved the duodenum at all The common cause is disruption of a duodenal suture line secondary to necrosis tension local hematoma or simply poor closure Usually local peritonitis is evident shortly after operation with pain fever ileus and leukocytosis During the first week an abscess collects under the abdominal incision and this opens through to the surface during the second week Then there is loss of great amounts of fluid and electrolytes with necrosis and destruction of the local tissues

Treatment depends largely on the nature of the original operation If the duodenal stump was closed following gastrectomy and gastrojejunostomy further surgery will not help If the fistula followed simple closure of a perforated ulcer or end to end gastroduodenostomy without gastrojejunostomy it may be helpful to carry out an exclusion operation The fistula itself cannot be attacked surgically and in fact conservative measures are probably best in most cases Ideally this consists of constant gastric and duodenal aspiration with instillation of the aspirate through a second tube into the upper jejunum As one can well imagine this is a difficult technical feat In any case the stomach must be kept as dry as possible and fluid and electrolyte balances maintained In addition nutrition and the general needs of the patient such as blood replacement and care of the deep leg veins must be tended About one third of the patients die usually of secondary infection following upon nutritional deficiency and severe invalidism In the others the fistula eventually closes spontaneously after weeks or months It is said that duodenal stenosis and cicatricial biliary obstruction are not particularly common sequels

all cases epigastric or right upper abdominal pain develops while the tumor is still small The symptoms and signs of duodenal obstruction appear quite suddenly in about half of the patients Meanwhile a remarkable degree of dilatation may have developed in the more proximal duodenum and the stomach The obstruction attending anorexia and perhaps the catabolism of the carcinomatous process can be blamed for quick weight loss and weakness Occult melena is almost always present and frank hemorrhage is not rare Anemia gradually develops

The findings upon examination of the abdomen are usually disappointing Sometimes clapotage can be demonstrated but other evidence of obstruction is not found It is possible to outline a tumor mass in some patients Because in approximately 20 per cent of cases there is local perforation with the formation of a restricted abscess demonstration of an enlarging mass should suggest the possibility that this has happened Jaundice sometimes develops late in the course

Again one must rely largely on roentgenologic help and perhaps fortuitous cytologic study for the diagnosis Suprapapillary carcinomas produce local duodenal irregularity narrowing and proximal dilatation and retention Infrapapillary tumors are notoriously difficult to detect and study because of their retrogastric position When obstruction becomes nearly complete megaduodenum develops to severe degree

Treatment of duodenal carcinoma is a surgical matter and sometimes the results are good The less extensive procedures carry an operative mortality risk of only about 10 per cent When at operation it appears that all tumor has been removed one can plan on three year survival in about half the patients The surgical plan must be governed by the operative findings

PRIMARY SARCOMAS

In the duodenum the sarcomas are poorly known Individual case reports which appear from time to time suggest leiomyosarcoma and the lymphosarcomas to be the most common among these rare tumors Other types have been described In keeping with the behavior of sarcomas elsewhere malignancy is believed to be present from the tumors onset Exoduodenal growth is sometimes the habit of leiomyosarcoma so that a large tumor mass develops before local functions are disturbed Intraluminal sarcomas tend to erode and bleed early Necrosis with perforation of the duodenal wall and fistula formation has been reported a few times As elsewhere in the small bowel encircling lymphosarcomas may become excavated from the inside producing local dilatation of the lumen at the tumor s site This appears to be a reliable roentgen sign of lymphosarcoma In addition to clinical and roentgenologic examination cytologic study of duodenal aspirates may be helpful for diagnosis X irradiation therapy affords a degree of palliative help in certain types Some are multicentric from onset the duodenal lesion being just one of many

DUODENAL FISTULAS

INTERNAL FISTULAS

A fistula which connects the duodenum with other internal organs or structures constitutes a very different clinical problem from one which opens to the exterior through the abdominal wall and the two should be thought of as separate diseases Internal fistulas may open into any structure in the immediate vicinity and occasionally into more distant ones including the stomach colon kidney portal vein bladder pleura and pericardium All are rare The majority connect with the biliary tract Adherence is a prerequisite to fistula formation so that gall bladder disease rather than duodenal disease ordinarily is at fault when a cholecystoduodenal fistula develops The common cause is passage of a gallstone through the walls of an inflamed gallbladder and adherent duodenum Less commonly carcinoma of the gall bladder or duodenal ulcer may be the basic disease In the case of choledochoduodenal fistula duodenal ulcer is more likely to be at fault presumably because of the anatomic

CHAPTER 8

GASTROINTESTINAL BLEEDING

INTRODUCTION

Bleeding from the gastrointestinal tract has positive significance whenever it is encountered Serious as it may be in its own right as a potential threat to life it is perhaps more important as a warning of the presence of significant organic disease Bleeding of course automatically implies erosion or ulceration and because a characteristic common to almost all gastrointestinal lesions is their ability to cause loss of superficial tissue a show of blood points to no particular diagnosis Perhaps this all inclusiveness is the special virtue of bleeding as a clinical sign The diagnostic problems which it necessarily raises may be the most difficult encountered in gastroenterology The smallest most insignificant lesion may lead to exsanguination and death while the huge carcinoma may produce only occult bleeding from time to time So bleeding is at the same time one of the most helpful and one of the most challenging manifestations of gastrointestinal disease It can never be ignored and a passive attitude towards immediate detection of its source is in this era intolerable

GENERAL CHARACTERISTICS OF GASTROINTESTINAL BLEEDING

There are several general considerations which are helpful in understanding the behavior of gastrointestinal bleeding When one is faced with a case of bleeding the first diagnostic concern is whether the source is in the upper or lower gastrointestinal tract Bleeding from the upper gastrointestinal tract which is understood to mean from a site proximal to the ligament of Treitz is much more likely to create a therapeutic emergency and consequently to call for radical diagnostic and therapeutic measures than is that from the small bowel or colon Lesions in the latter

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of gross amounts from the right side of the colon usually produces stools of dark red color Blood from the left colon and sigmoid is ordinarily passed quickly and often it appears unaltered It is likely to stimulate diarrhea and thus seems more thoroughly mixed with the feces than one might guess it would be

Careful delineation between blood in the stool and blood on the stool is of great diagnostic importance It is uncommon for the patient to make accurate observations on the point until he is so instructed Only a bleeding source which is in the anal canal or just within the most distal rectum can cause streaking of blood on the stool s surface A lesion higher in the rectum can do no more than coat a formed stool with blood without streaking When blood is found to be mixed in with a formed stool the source can be assumed to be orad to the splenic flexure No rules apply when there is diarrhea

GENERAL CLINICAL ASPECTS

The clinical effects of gastrointestinal bleeding depend on both the amount and rapidity of blood loss The latter is more important in many respects The body regenerates blood quickly and there may be considerable chronic bleeding without development of anemia The healthy adult can lose 500 ml of blood quickly as by a blood donation without feeling any adverse hemodynamic effects On the other hand sudden loss of 2000 ml may kill Approximately 10 per cent of unattended adult people who lose half of their circulating volume over a 12 hour period will die by the time the 50 per cent mark is reached The classic symptoms and signs of sudden hemorrhage—weakness nausea faintness sweating palpitation chilliness cramps sudden bowel movement and anxiety—are well known and require no elaboration

A common experience among ulcer patients is to feel a sudden urge to move the bowels to have a large blood stool to faint and then to vomit blood About one third of people who faint from gastrointestinal bleeding do so in the bathroom and locked in at that Thus they may receive no attention until after there has been considerable blood loss In a small proportion of ulcer cases hemorrhage is accompanied by ulcer perforation and although ulcer complication may be easily diagnosed the clinical drama of acute peritonitis may obscure the importance of the bleeding

It is common to find that uncomplicated hemorrhage of itself produces in some patients particularly the elderly a clinical picture which points primarily to quite a different diagnosis Often the symptomatic picture is that of major arterial occlusion or insufficiency especially myocardial infarction or angina pectoris Sometimes of course infarction is actually precipitated by blood loss The signs of acute heart failure are commonly displayed by old people who have had a sudden hemorrhage Other conditions which most often overshadow the gastrointestinal emergency in the geriatrics group are cerebrovascular accident and acute renal shutdown Amaurosis which is probably of central hypoxic origin is more commonly encountered in the old patient than the young

If the patient is confused or otherwise unable to talk to the doctor it is easy to overlook the gastrointestinal problem entirely The gastrointestinal tract of old people seems somewhat less sensitive to the stimulating effect of blood than that of young people and it is usually in this group that one observes the rare and remarkable phenomenon of mortal exsanguination within the tract without external show of blood The importance of routine rectal examination with recovery of a bit of fecal material for inspection can sometimes be dramatically demonstrated however for the rectum may be full of blood even though none has yet been passed

Usually the color of the patient s skin and mucous membranes does not immediately reflect the degree of anemia and in an old man there may be no suggestion of paleness at all There is no more helpful clinical means of detecting and estimating blood loss

organs are more likely to bleed occultly and over long periods Although as a rule a significant amount of bleeding into the upper gastrointestinal tract leads to hematemesis the manner by which blood reaches the outside is not a reliable way of judging the general region of its origin One may be seriously misled for instance if he assumes that melena in the absence of hematemesis is an indication of lower gastrointestinal bleeding Almost always even blood which is lost slowly from the posterior nares nasopharynx mouth and lower pharynx is swallowed often without the patient s realization and it then comes to light only in the form of melena In many cases blood originating within the respiratory tract behaves the same way It must be recalled that a person can bleed to death within the gastrointestinal tract in the absence of any external show of blood Unusual as this may be it constitutes a warning regarding blood show as a diagnostic sign Hemorrhage from the esophagus stomach or duodenum leads to hematemesis only when it is of sufficient amount to stimulate vomiting Even when quick and of large amounts in some patients it does not do so Rarely on the other hand reverse peristalsis may cause blood of jejunal origin to be vomited

The change that blood produces in the appearance of the stool depends on the amount and rapidity of bleeding the location of the source and the speed of intestinal transit When a stool does not contain a large amount of blood the appearance is further governed by the presence or absence of the normal fecal pigments Both clinical observations and experimental blood imbibition studies permit certain generalizations As blood passes down through the tract it becomes darker and darker and pure blood or intestinal contents composed largely of blood eventually becomes black The chemical changes seem to be rather complicated Conversion to hematin occurs quickly in the presence of the stomach s hydrochloric acid and black hematemesis may occur rather soon after bleeding into the stomach Blood which arises from the duodenum or jejunum must be retained in the tract for at least eight or perhaps ten hours in order to turn black Grossly bloody stools will be observed in cases of upper gastrointestinal bleeding if intestinal transit time is very rapid A black stool may be produced when gross bleeding arises from the ileum or below but this is very rare Dark red is the rule Whatever the source in order for a black stool to be created there must be loss of at least 100 ml of blood and the loss must be rapid Following a hemorrhage traces of blood sufficient to give a positive chemical stool test may persist as long as three weeks but about seven days is a more common limit

There are a few features of stool and vomitus color which are characteristic of the bleeding from different levels of the gastrointestinal tract One of these concerns high arterial bleeding When the source is arterial and the site is the esophagus stomach or proximal duodenum and if a large amount is lost rapidly and is quickly vomited its arterial quality may be recognized with assurance from its color This does not happen very often because even blood which is lost quickly tends to sojourn for a while in the stomach before it is vomited If however one aspirates the stomach for a few minutes through a large caliber tube he is able to recover the blood immediately and often can then recognize its arterial nature On the other hand one is never justified in predicting a venous source from the color of vomitus or aspirate because of the rapidity with which bright red blood may turn dark in the stomach

Lesions within the common bile duct or at the papilla may by producing biliary obstruction in addition to bleeding cause the stools to take on a peculiar silvery appearance (silver stool sign of Thomas) This is classically but not always encountered in carcinoma of the papilla of Vater When adults bleed from the small intestine blood loss is usually slow and of relatively small amounts and often chemical examination of the stool is necessary to prove it This does not apply to infants and children Bleeding

TABLE 8 INCIDENCES OF RESPONSIBLE DISEASES AMONG 240 ADULT PATIENTS WITH MASSIVE UPPER GASTROINTESTINAL HEMORRHAGE STUDIED BY THE VIGOROUS DIAGNOSTIC APPROACH

	%
Duodenal ulcer	22
Erosive gastritis	16
Gastric ulcer	13
Esophageal varices	12
Esophagitis	8
Hiatus hernia from stomach	5
Mallory Weiss syndrome	5
Gastric varices	3
Rendu Osler Weber disease	2
Stomal ulcer	0 8
Esophageal ulcer	0 4
Leiomyoma of stomach	0 4
Prolapse gastric mucosa into esophagus	0 4
Jejunal polyp	0 4
Carcinoma of stomach	0 4
Not determined with assurance	12

TABLE 9 INCIDENCES OF RESPONSIBLE DISEASES AMONG 300 ADULT PATIENTS WITH SIGNIFICANT LOWER GASTROINTESTINAL HEMORRHAGE DIAGNOSED IN MANY INSTANCES AFTER BLEEDING HAD STOPPED

	%
Ulcerative colitis	28
Carcinoma of rectum	13
Benign rectal polyps	13
Hemorrhoids or anal fissure	10
Rectal trauma (biopsy or factitious)	7
Carcinoma of colon	6
Regional enteritis	4
Small bowel polyps	4
Familial polyposis of colon	3
Lymphosarcoma of jejunum	1
Meckel s diverticulum	1
Mesesenteric venous thrombosis	1
Hemangioma of ileum	1
Lipoma of colon	0 7
Intussusception	0 7
Undetermined	7

with the diseases which may cause hemor rhage Unless one is in the habit of examin ing the patient during active bleeding he will not acquire an appreciation of the cor rect incidences or expectancies of the various upper gastrointestinal bleeding lesions

The second deterrent to an accurate diag nosis is the history of a previously detected lesion which is capable of causing hemor rhage Automatic assumption that the cur rent hemorrhage is due to the lesion which is known to exist is difficult to avoid When obtaining the history one tries especially hard to uncover some indication that the patient has in the past had gastrointestinal troubles which can be tied up with the current episode Yet it has been found that in only about half of patients who have previously been proved to have a potential source of hemor rhage is the current hemorrhage from that source This revelation which can readily be confirmed by examining patients en doscopically and roentgenologically during active bleeding must serve as an important warning regarding the danger of misdirect ing emergency surgical intervention Emer gency subtotal gastrectomy for a known ulcer can only harm without helping the patient who is actually bleeding from esophagitis Similarly time is lost if the known cirrhotic patient who is bleeding from an unsuspected ulcer is treated by esophageal tamponade It should be carefully noted that patients with portal hypertension secondary to cirrhosis are very susceptible to erosive gastritis and hemorrhage therefrom and that there is a higher incidence of gastroduodenal ulcer among people with cirrhosis than among people without cirrhosis Approximately one sixth of cirrhotic patients with hemorrhage do not have varices and about one third have other chronic upper gastrointestinal diseases which have bleeding potentialities

The third and most basic problem is created by delay in examining the patient There can be little quarrel with the proposal that early accurate diagnosis is something of a necessity when hemorrhage is the con sideration In clinics the world over the deterrent to diagnostic study is fear of ag gravating the bleeding Medical training is directed in such a way that the doctor finds himself instinctively afraid of the patient with gastrointestinal hemorrhage In particu lar there is prejudice against passing a tube

than examination of the palmar creases when the fingers are forcibly extended Normally the creases become bright red An intense color is often found even in shock if there is no anemia When the circulating hemo globin is less than half of normal the intensity of the color in the creases does not change upon hyperextension Strangely im mediately following hemorrhage of severe degree the creases are often found to be pale even though not enough time has passed for spontaneous reconstitution of the blood volume to have occurred

After the immediate emergency has been met there are some interesting clinical phe nomena for the gastroenterologist to watch When the ulcer patient recovers a little he usually finds that his ulcer pain has gone and there may be no further ulcer symptoms for many days or weeks Fever occurs in the majority of patients with important gastro intestinal hemorrhage regardless of the source It usually appears within 24 hours and may last a week reaching 103 F Fever does not follow experimental ingestion of blood for reasons which are not clear Leukocytosis similarly is to be expected in most instances of bleeding Clinical jaundice can only rarely be detected after three or four days have passed It should be noted however that hyperbilirubinemia is common measurement of the serum bilirubin cannot be utilized for detection or evaluation of any liver disease which may be present until several days have passed

Alimentary azotemia always develops to some extent in severe upper gastrointestinal hemorrhage It does not accompany hemor rhage from the colon One must bear in mind that sudden massive hemorrhage may lead to important renal impairment espe cially in the older patient Because alimentary azotemia is expected care must be exercised to avoid overlooking renal azotemia

DIAGNOSIS

PHILOSOPHY OF APPROACH

Technics for emergency control of severe upper gastrointestinal hemorrhage have been developed to a high degree and if the drop in mortality figures has been a bit dis couraging it cannot be blamed on technical ineptness Rather too often it is necessary to carry out emergency therapy in the face of frightening diagnostic myopia Emergency therapeutic technics are available and ef fective for direct attack on specific bleeding sites but they become as nothing unless directed at the proper lesion The day has passed when it was sufficient for the doctor merely to support the patient Quick precise identification of the bleeding site has be come a matter of major practical importance It is true of course that only a portion of patients will eventually require radical ma nipulative therapy but which ones they may prove to be can infrequently be predicted at the outset

There are three important deterrents to accurate clinical diagnosis when approaching a case of gastrointestinal hemorrhage First there is the natural tendency to play medical statistics and to assume that hematemesis al most always indicates bleeding ulcer In most reported series of hemorrhage patients ulcer predominates with an incidence of from 75 to 95 per cent Some doubt must be cast upon such reports however because they almost always indicate what potential bleed ing lesions have been found in bleeding patients not necessarily what lesions were actually responsible for the bleeding It is becoming increasingly clear that ulcer has been blamed for too great a proportion of hemorrhages merely because after bleeding stops it is the only lesion that can be demon strated by roentgenologic examination But ulcer patients bleed from lesions other than ulcer and in fact erosive gastritis and erosive esophagitis are found commonly to be the true source when ulcer patients are ex amined endoscopically during active bleed ing Both are potent causes of hemorrhage but neither can be diagnosed by roentgen technics Esophageal varices and gastric ulcer are other diseases which are particularly likely to be overlooked in the initial clinical estimation In Tables 8 and 9 are summarized some experiences from one general hospital

varices or from a large ulcerated sclerotic artery This virtue of ice water may add to the endoscopist s problem paradoxically be cause at least at small amount of oozing must be visualized if a certain diagnosis is to be established

Esophagoscopic examination is carried out as soon as the Ewald tube is withdrawn No sedation or oral anesthesia is ordinarily used The esophagoscope must be passed under direct vision rather than with the help of an obturator both because recent roent genologic information on the esophageal configuration will rarely be available in the patient s case and because in this situation it is important to inspect the hypopharynx on the way down

Discovery that the bleeding lesion is within the esophagus frequently permits effective emergency treatment on the spot If physical examination has suggested cirrhosis it is well to pass a Sengstaken tube and to inflate the gastric balloon immediately prior to esophagoscopy Then detection of bleeding varices permits injection of a sclerosing solu tion if one wishes and immediate inflation of the esophageal balloon If unexpected esophageal varices esophagitis or esophageal ulcer is encountered a Sengstaken tube may be put in place immediately upon with drawal of the esophagoscope This of course precludes gastroscopic examination and the opportunity to obtain early information about the possible presence of a second bleeding site such as gastric varices

Gastroscopy immediately follows esopha goscopy unless the latter has shown the stomach to be refilling with blood whereupon lavage must be repeated Bleeding lesions are usually located with ease by following a blood rivulet to its source The lesion itself may seem very small for the amount of the observed bleeding the seriousness of hemorrhage from an ulcer as from any lesion depends not on its size but on the size and number of the blood vessels in volved On the other hand the entire mucosal surface may be bleeding if erosive gastritis is at fault Specific identification of a circum scribed lesion may sometimes be impossible because of large adherent clots Discovery of fresh blood running back into the stomach through the pylorus permits a presumptive diagnosis of bleeding duodenal ulcer al though there are other rare possibilities

Fluoroscopic examination immediately fol lows gastroscopy even though the bleeding site has already been found If a Sengstaken tube has been passed the opaque medium is introduced through its central channel The radiologist should use whatever manipula tions and abdominal pressures he feels neces sary to obtain maximum information from the examination There is little to be gained from fluoroscopy carried out in fear

In some instances it is possible for the clinician to have at hand definitive esopha goscopic gastroscopic and roentgenologic in formation within an hour of the patient s admission In others various considerations might change the routine of the work up or lengthen the period of study There is nothing to suggest that the vigorous diag nostic approach ever aggravates hemorrhage or in any way handicaps the patient s chance of survival Skillful passage of tubes and instruments will not initiate or aggravate variceal bleeding The radiologists who par ticipate similarly find no reason to regret insistence on a thorough examination

OTHER TECHNICS FOR STUDYING BLEEDING

In addition to roentgenologic and en doscopic examination technics there are sev eral indirect methods which may be helpful in studying patients with either gross or occult bleeding

Simple *gastric aspiration* for inspection of the stomach contents may give remarkably helpful information in the patient who has gross melena in the absence of hematemesis by answering immediately the question of whether the bleeding site is in the upper gastrointestinal tract

The *string test of Einhorn* is a good technic for locating the source in cases of slow oozing somewhere orad of the ligament of Treitz Narrow white tape of a length to

through the esophagus which may contain varices and against palpating an abdominal wall which may overlie a bleeding ulcer If facilities cannot be made available for taking emergency therapeutic advantage of quick diagnosis possibly diagnostic reticence is justified In the hospital environment however fear of the bleeding patient can only lead to disservice to him To reiterate quick accurate diagnosis proves of practical importance only when direct action can be taken to stop the hemorrhage but this is an unpredictable matter at the time the patient is first encountered

An approach to the problem of early diag nosis during active bleeding from the upper gastrointestinal tract is discussed below It should be noted that in addition to the immediate clinical help furnished there are certain long term benefits which may accrue If diagnostic efforts are delayed until after bleeding stops the source of bleeding can never be determined with assurance A cer tain diagnosis can be made only if the lesion is directly inspected and seen to be bleeding The problem later on is likely to be that study either reveals no possible bleeding source or it shows more than one *Some lesions heal very quickly following* cessation of bleeding and they may be gone for the time being by the time study gets under way Erosive gastritis may repair it self and become undetectable in 12 to 24 hours and some cases of erosive esophagitis in perhaps 48 hours Both duodenal and gastric ulcers are stimulated to heal follow ing a hemorrhage and may fill in remark ably rapidly

VIGOROUS DIAGNOSTIC APPROACH TO SEVERE UPPER GASTROINTESTINAL HEMORRHAGE

The governing principle behind the vigor ous approach to diagnosis is that the doctor who is responsible for the patient with upper gastrointestinal hemorrhage must let as little time as possible elapse before he identifies with assurance the source of the hemorrhage This calls for esophagoscopic gastroscopic and radiologic examinations in this order as soon as the patient comes under medical surveillance The two endoscopic procedures permit positive identification of bleeding sites in pharynx esophagus and stomach and with the help of roentgen study in direct identification of bleeding sites in the duodenum Except for x ray studies the technic has the advantage of a fair degree of mobility The endoscopic examinations are most expeditiously carried out in the hospital s admitting room The ward examin ing room or a ward bed is suitable but there is no reason to move the patient from the admitting stretcher until he reaches the x ray room

As soon as the patient is admitted blood is drawn for cross matching and blood replacement begun and continued as the clinical course may dictate The diagnostic manipulations may be carried out without important inconvenience even when trans fusions are being given into three extremities Meanwhile the history and physical examina tion are accomplished as completely as the clinical situation permits an assistant is dispatched to collect available previous clini cal records and x rays and the radiology department is alerted for the imminent flu *oroscopic examination*

As soon as the history is completed a # 30 Fr Ewald tube is passed into the stomach and thorough ice water lavage carried out This can be done effectively even though at the start the patient is vomiting large amounts of blood almost continuously It is worse than useless to use any but a large caliber tube for this A few quarts of ice water and 20 minutes may occasionally be required before bleeding stops In a *sense lavage is the most important* part of the technic for the success of the whole venture depends on a clean esophagus and stomach Ice water lavage is good emergency treatment for upper gastrointestinal *hemor* rhage It is a remarkable thing that it stops the bleeding for an hour or more in ap proximately 70 per cent of the patients and for days or weeks in about 50 per cent—even bleeding which is originating from esophageal

periods of time Most of the tests depend on the presence of peroxidase activity in the heme portion of hemoglobin Peroxidases are also found in meat and in pus and both may therefore give positive reactions This makes it impracticable to depend on very sensitive chemical reactions such as those which employ orthotolidine and benzidine The guaiac test seems to have an ideal degree of sensitivity but even though this is relatively coarse minor degrees of positivity are often best ignored It is not necessary to withhold meat from the diet for the guaiac test Experimentally from 1 to 10 ml of blood must be swallowed in order to produce a positive guaiac test In small bleedings much depends on the actual rate of bleeding and on the rate of transit for peroxidase enzymatic activity is partially lost along the way One may note for instance that about one hundred times as much fresh blood must be swallowed as directly mixed with 150 gm of feces in order to give the same degree of positivity with any of the chemical tests All in all it is well to remember that experimental blood ingestion studies prove that there are wide variations in the amount of blood necessary to give a positive result and that there is no way to predict how long positive reactions will persist following a blood meal

Spectrographic and immunologic technics are available for detecting blood in the stool but they are not needed in clinical practice

MEASUREMENT OF BLOOD LOSS

During and immediately following hemorrhage an accurate measure of the amount of blood lost can be made only by determining the circulating blood volume or by scanning the stools for radioactivity following intravenous administration of a measured quantity of tagged erythrocytes Unfortunately at this time there is no practicable way of making these technics readily available for routine use The two main deterrents to any other means for obtaining the information are the complete unreliability of estimating the amount of blood in vomitus and stool and the physiologic lag between hemorrhage and spontaneous reconstitution of the circulating volume It is fortunate that for clinical purposes the patient's physiologic response to his hemorrhage is much more important than the actual volume lost This can be determined For the first two or more hours after cessation of bleeding the patient is best measured through his pulse rate blood pressure and respiratory rate The necessity of individualizing therapy according to individual patient response is well brought out by these signs Their virtue is largely due to the fact that changes are synchronous with variations in physiologic response A sudden rise in the pulse rate from 100 to 120 is immeasurably more meaningful than a report from the laboratory that the hemoglobin level has dropped from 10 to 8 gm

After stabilization of both clinical course and circulating volume measurement of the hemoglobin level hematocrit and erythrocyte concentration are satisfactory enough for estimating the damage done and response to treatment

OTHER SOURCES OF GASTROINTESTINAL BLEEDING

Because all that is required for gastrointestinal bleeding is loss of superficial mucosal tissue there is not an organic disease of the hollow parts of the tract which may not sometimes become eroded or ulcerated and cause bleeding A classification of potentially bleeding lesions is a classification of the tract's organic diseases Some quite naturally are more important than others and certain ones constitute special threats in this regard These matters are discussed under the individual diseases and there will be no repetition here There follow discussions of a few bleeding conditions which are not covered elsewhere

HEREDITARY HEMORRHAGIC TELANGIECTASIS (RENDU OSLER WEBER DISEASE)

This disease has always held particular fascination for the gastroenterologist because

reach the distal duodenum is swallowed by the fasting patient fastened at the mouth left in place overnight and withdrawn and examined for a blood spot in the morning The tape should be examined while it is still wet because it may fade as it dries The bleeding source can be roughly localized by measuring the distance of the spot from the part of the tape which was at the mouth In addition the location of the papilla of Vater is often indicated by a bile spot assisting localization of the source of the blood spot Because the tape shows some tendency to migrate up and down during its sojourn further help may be obtained by clipping a few reference paper staples in the tape and obtaining an abdominal x ray film before it is withdrawn

The *Van Noate test* is a useful although tedious technic for locating the level of a bleeding lesion suspected of being further down in the small intestine A Miller Abbott tube is permitted to travel down through the intestine and material is aspirated for inspection at frequent intervals If the patient has only occult melena the aspirates must be chemically tested for blood Because of the mixing which goes on within the small bowel localization can be only approximate Having this technic and the string test at his disposal the gastroenterologist is often able to locate the source of continuous oozing when other diagnostic studies fail to show a lesion

Emergency use of the *bromsulfalein excretion test* has been recommended as a means for distinguishing between variceal and other sources of bleeding by permitting quick estimation of the presence of liver disease It has very limited usefulness because it gives only indirect circumstantial diagnostic information Patients with cirrhosis commonly bleed from diseases other than varices For a diagnosis it is necessary to get much closer than this to the bleeding lesion

Aortography may help localize active arterial bleeding but it is of limited usefulness because the amount of information it furnishes probably does not warrant the risk involved Radiopaque material is injected into the aorta proximal to the celiac axis Abdominal x ray films then may show a puddle of opaque material in the lumen of the tract at the site of bleeding

Microscopic examination of the stools so important for the solution of many gastrointestinal problems is not particularly helpful for the study of bleeding Erythrocytes are quickly destroyed in the feces Their presence on a formed stool indicates an anal or very low rectal source Some which arise from the right side of the colon may escape crenation if transit time is very rapid Discovery of Charcot Leyden crystals which have an elongated spindle shape and range from 5 to 25 micra in length indicates that altered hemoglobin is present in the tract When the crystals are encountered in plain smears during parasitologic examination they should suggest study regarding slow gastrointestinal bleeding

Chemical examination for occult blood in the stool is the most generally useful screening test for patients with gastrointestinal complaints and in more and more practices it is becoming part of the routine study of all patients It furnishes much more in the way of screening information than do many other routine studies such as the serologic test for syphilis The gastroenterologist has a responsibility to publicize to his colleagues the importance of this simple and inexpensive test

Stool tests for occult blood are often as difficult to interpret as they are easy to p r form and this is a frailty which demands constant attention from the clinician A laboratory report must not be confused with judgment If tests for blood are not interpreted with mature caution they may cause unnecessary anxiety for the patient and waste of time and useless expense for all concerned In evaluating them several points must be borne in mind A positive test tells of bleeding which occurred many hours ago if it indicates bleeding at all Whether or not bleeding is continuous cannot be determined by this technic except over long

it may be very severe The stomach is by far the most important source and its distal portion is usually involved Although many interesting measures have been employed in an effort to eradicate the lesions throughout the body or to render them less susceptible to hemorrhage none has proved useful in altering the course of the illness In all instances of gastrointestinal bleeding in this disease it is important to be sure that the source is not the nose If the bleeding is found to be from the stomach as is usually the case ice water lavage will stop it for the moment In desperate hemorrhage gastric resection may on a rare occasion be necessary but unless accurate gastroscopic information is available it is difficult to know how much of the stomach should be sacrificed Furthermore even if all the lesions are included in the resected portion it is quite possible for new ones to develop later on in the gastric stump For these reasons it is best not to become committed to a radical approach

MALLORY WEISS SYNDROME

This is a relatively common cause of upper gastrointestinal bleeding but it has not received the publicity it deserves Severe emesis can cause traumatic mucosal lacerations at the cardia leading to hemorrhage Usually one tear is produced just below the esophagogastric junction but there may be three or four and they may cut across the junction to split the esophageal as well as the gastric mucosa Most such lacerations parallel the axis of the esophagus Some are oblique others run transversely The tears may be from one to a few centimeters in length They extend down into the submucosa but rarely involve the muscularis propria

The usual cause is the vomiting of acute alcoholism and Mallory and Weiss originally described the syndrome as a complication of this disease The concept has now been expanded to include bleeding from traumatic lacerations caused by the vomiting of pregnancy of the postoperative state acute food poisoning pyloric obstruction and indeed of any situation which may be accompanied by hard vomiting

The diagnosis should be suspected from the history Always there is repeated vomiting of bloodless material followed after a variable period by hematemesis Usually the amount of blood lost is rather inconsequential but at times sudden massive and even exsanguinating hemorrhage results Its origin is both arterial and venous and it is worth noting that this is one of the few situations in which gastrointestinal bleeding has a combined origin

Gastroscopically and sometimes esophagoscopically a linear gapping mucosal split is found It is not a simple picture because in spite of gastric lavage a clot always seems partly to obscure the lesion Furthermore the lesion lies in that part of the stomach which is easily burned by the heat of the gastroscope lamp The factitious lesion so produced is diffuse and hemorrhagic when examined immediately and although it may obscure it cannot be confused with a tear If the clinical impression of Mallory Weiss syndrome is to be confirmed a linear lesion must be demonstrated

Without vigorous therapy there sometimes may be a fatal outcome Treatment by tamponade is usually most satisfactory The Sengstaken tube is used only its gastric balloon being inflated Twenty four hours of tamponade are usually sufficient With healing of the lesion the condition is cured until next time

AORTIC FISTULAS

When the aorta bleeds into the gastrointestinal tract the fistula almost always opens into either the esophagus or the duodenum The usual cause is aortic aneurysm and exsanguination by way of the gastrointestinal tract is not an excessively rare terminal event for the aneurysm patient Approximately 3 per cent of all thoracic aortic aneurysms rupture into the esophagus Most of these are of syphilitic nature Sometimes a tuberculous lymph node opens a fistula between the normal aorta and the esophagus Approxi

it is one of very few explanations for gastro intestinal hemorrhage which can usually be diagnosed with assurance from the history and physical examination The main features of the disease are a strong familial incidence *multiple telangiectases of skin and mucous* membranes and recurrent hemorrhages from

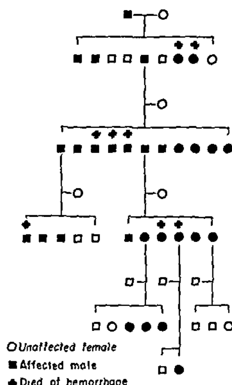


Fig 92 Rendu Osler Weber disease Sibship of family with bad mendelian luck It was not until the third generation shown here *that the diagnosis of the family s trouble was* made

the nose or gastrointestinal tract It is not excessively rare At least 250 families with about 1500 members are known It is inherited as a simple dominant characteristic without sex linkage (Fig 92) The sexes therefore are equally affected and either may transmit the disease *Although it may* seem at times that a generation has been skipped this is usually explained by failure of recognition

The patient seeks help because of hemorrhage usually from the nose sometimes from the gastrointestinal tract Hematemesis in this disease has been called Goldstein s hematemesis Often of course, hematemesis and melena are explained by blood swallowed from the nose The first hemorrhage often occurs during late childhood although the fourth decade is a common time for onset *in a portion of cases A family history* of bleeding is almost always elicited and often the patient or parents know the family s disease well The older patient usually gives a history of repeated severe hemorrhages in the past Characteristically these have been very difficult to control

*Examination shows the characteristic le*sions over the lips about the face in the mouth over the nasal septum and often over the hands chest and back In patients who are studied endoscopically the esophagus stomach sigmoid colon and rectum are sometimes found to be involved The internal lesions *can be diagnosed only endoscopically* and at times at autopsy and their incidences are not well known Gastrointestinal localization is believed to exist however in about half the cases Other localizations are trachea bronchus liver spleen meninges lungs and genitourinary tract Arteriovenous fistula involving a branch of the pulmonary artery has been noted with some frequency Hepatomegaly and splenomegaly are rather common Although telangiectases may be present in both organs *the cause of enlargement* is not understood

The individual telangiectases wherever they occur vary in size from pinpoint dots to about 5 mm in diameter They are either flat slightly elevated or hemispheric and vary in color from blue black to light purple Each lesion represents dilatation of a venule and microscopically little more than a layer of endothelium and a thin layer of epithelium is found Although characteristically the le*sions slowly regress and disappear* only to reappear after a variable interval there is no muscle or other obvious regulatory apparatus in their walls They sometimes disappear quickly *following a major hemorrhage*

The gastrointestinal bleeding of Rendu Osler Weber disease constitutes a very difficult problem in therapy It is recurrent

it may be very severe The stomach is by far the most important source and its distal portion is usually involved Although many interesting measures have been employed in an effort to eradicate the lesions throughout the body or to render them less susceptible to hemorrhage none has proved useful in altering the course of the illness In all instances of gastrointestinal bleeding in this disease it is important to be sure that the source is not the nose If the bleeding is found to be from the stomach as is usually the case ice water lavage will stop it for the moment In desperate hemorrhage gastric resection may on a rare occasion be necessary but unless accurate gastroscopic information is available it is difficult to know how much of the stomach should be sacrificed Furthermore even if all the lesions are included in the resected portion it is quite possible for new ones to develop later on in the gastric stump For these reasons it is best not to become committed to a radical approach

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AORTIC FISTULAS

When the aorta bleeds into the gastrointestinal tract the fistula almost always opens into either the esophagus or the duodenum The usual cause is aortic aneurysm and exsanguination by way of the gastrointestinal tract is not an excessively rare terminal event for the aneurysm patient Approximately 3 per cent of all thoracic aortic aneurysms rupture into the esophagus Most of these are of syphilitic nature Sometimes a tuberculous lymph node opens a fistula between the normal aorta and the esophagus Approxi

it is one of very few explanations for gastro intestinal hemorrhage which can usually be diagnosed with assurance from the history and physical examination The main features of the disease are a strong familial incidence multiple telangiectases of skin and mucous membranes and recurrent hemorrhages from

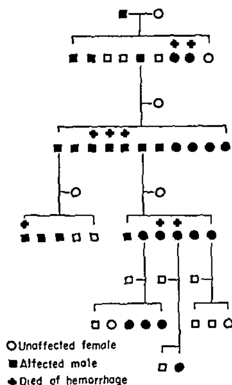


FIG 92 Rendu Osler Weber disease Sibship of family with bad mendelian luck It was not until the third generation shown here that the diagnosis of the family s trouble was made

the nose or gastrointestinal tract It is not excessively rare At least 250 families with about 1500 members are known It is inherited as a simple dominant characteristic without sex linkage (Fig 92) The sexes therefore are equally affected and either may transmit the disease Although it may seem at times that a generation has been skipped this is usually explained by failure of recognition

The patient seeks help because of hemorrhage usually from the nose sometimes from the gastrointestinal tract Hematemesis in this disease has been called Goldstein s hematemesis Often of course hematemesis and melena are explained by blood swallowed from the nose The first hemorrhage often occurs during late childhood although the fourth decade is a common time for onset in a portion of cases A family history of bleeding is almost always elicited and often the patient or parents know the family s disease well The older patient usually gives a history of repeated severe hemorrhages in the past Characteristically these have been very difficult to control

Examination shows the characteristic lesions over the lips about the face in the mouth over the nasal septum and often over the hands chest and back In patients who are studied endoscopically the esophagus stomach sigmoid colon and rectum are sometimes found to be involved The internal lesions can be diagnosed only endoscopically and at times at autopsy and their incidences are not well known Gastrointestinal localization is believed to exist however in about half the cases Other localizations are trachea bronchus liver spleen meninges lungs and genitourinary tract Arteriovenous fistula involving a branch of the pulmonary artery has been noted with some frequency Hepatomegaly and splenomegaly are rather common Although telangiectases may be present in both organs the cause of enlargement is not understood

The individual telangiectases wherever they occur vary in size from pinpoint dots to about 5 mm in diameter They are either flat slightly elevated or hemispheric and vary in color from blue black to light purple Each lesion represents dilatation of a venule and microscopically little more than a layer of endothelium and a thin layer of epithelium is found Although characteristically the lesions slowly regress and disappear only to reappear after a variable interval there is no muscle or other obvious regulatory apparatus in their walls They sometimes disappear quickly following a major hemorrhage

The gastrointestinal bleeding of Rendu Osler Weber disease constitutes a very difficult problem in therapy It is recurrent and

bad they are often frightened by what they see Many know that blood may turn the stools black Often too patients with hemoptysis are convinced that the blood came from the stomach because gagging and vomiting are so common during the coughing up of blood In another group of people gastrointestinal bleeding is purposefully induced or faked in order to elicit sympathy to obtain disability benefits to escape legal incarceration or perhaps to obtain a dose of morphine In any of these situations the history and physical examination often give no hint of the misinterpretation hoax or fraud as the case may be and it is of course quite necessary to approach each patient suspected of bleeding with full faith that something organic is amiss

Many ingestants can alter stool color some to simulate hematochezia or melena A large meal of beets may make the stool red and turn water in the toilet red Tomato skins retain their color after passage through the gastrointestinal tract and are commonly misinterpreted as blood flecks Ferrous sulfate which in therapeutic doses regularly causes the stools to become dark or even black gives a weakly positive guaiac test although the benzidine test remains negative Other medicinals which commonly lead to erroneous diagnosis of melena are the bismuth compounds charcoal and licorice

Methods sometimes used to incite bleeding are biting of the side of the tongue or cheek and inserting foreign objects into the rectum Sometimes a person may drink animal blood cut the skin and drink his own blood or obtain his blood by venesection or actual venipuncture

HEMORRHAGE IN CHILDREN

Gastrointestinal bleeding is a common pediatric problem To the gastroenterologist who ordinarily deals with adult patients this is a confounding subject for it has a disease-expectancy which seems strange Furthermore the familiar diagnostic technics sometimes cannot be used because of the size of the patient and even when they can they are far less likely to furnish specific help

The common sources of hemorrhage in children are in general order of frequency chronic ulcerative colitis intussusception Meckel s diverticulum volvulus the blood dyscrasias small bowel and colon polyps gastric ulcer acute infectious enteritis esophageal varices hiatus hernia erosive esophagitis and rectal prolapse Cushing effects are prominent among the erosive and ulcerative lesions Prematurity often points to the possibility of a congenital defect In malnourished babies pharyngeal and esophageal thrush is a rather common explanation for melena and hematemesis

Diagnostic difficulties are many For reasons unknown babies and children who bleed from the upper gastrointestinal tract are less likely to vomit the blood than are adults Melena without hematemesis therefore does not have quite the usual significance in the very young patient In determining the level of bleeding aspiration of the gastric contents for evidences of blood is particularly important Both roentgenologic and esophagoscopic examinations are difficult technically and often they are inconclusive in babies Gastroscopy is not possible in this age group Sigmoidoscopy on the other hand is just as useful as it is in the adult In spite of all diagnostic efforts it has been the experience of most pediatricians that if blood dyscrasia has been excluded as the cause severe melena in a child almost always necessitates abdominal laparotomy for accurate diagnosis and proper treatment

TREATMENT

GENERAL ASPECTS OF EMERGENCY TREATMENT

As previously pointed out the time has past when it was necesary to carry out emergency treatment in the face of complete diagnostic myopia Although the need for specific diagnosis in effective implementation of therapy is discussed under the individual diseases there are a few generalities

mately 8 per cent of abdominal aortic aneurysms which are almost exclusively of arteriosclerotic origin eventually bleed into the gastrointestinal tract the great majority into the third portion of the duodenum Hemorrhage from the terminal portion of the aorta or iliac arteries into the colon or rectum is very rare It is usually a complication of severe arteriosclerosis Whatever the location or nature the initial bleeding is ordinarily of small amount Characteristically there are several small self limited hemorrhages hours or weeks apart followed by quick exsanguination

BLOOD DYSCRASIAS

Except in children primary diseases of hemostasis account for only a minor portion of gastrointestinal hemorrhages Whenever they are responsible for hemorrhage there almost always is evidence of bleeding from or into the skin or mucous membranes other than those of the gastrointestinal tract There is a warning here for in patients with such diseases as leukemia sudden hematemesis or melena cannot automatically be assumed to be due to the hematologic problem In spite of the facts that the patient with leukemia *often shows a generalized bleeding tendency* that he is especially vulnerable to erosive gastritis and that he may develop specific leukemic infiltrations of the stomach it is also true that he falls heir to all of the other *bleeding lesions of man Gastroduodenal* ulcer is not uncommon in patients with leukemia Determination of bleeding clotting and prothrombin times is important in the evaluation of every bleeding patient but rarely can the results be expected of themselves to have any diagnostic import

UREMIA

Gross pathologic alterations of the gastrointestinal tract are found in approximately 60 per cent of patients who die of uremia In about one third of these the clinical course has been marked terminally by hemorrhage and at autopsy it is found that there are widespread mucosal ulcerations or pseudomembranous erosions Mucosal edema and submucosal hemorrhage are very common pathologic changes whether or not mucosal necrosis has occurred There are wide individual variations in this susceptibility of the gastrointestinal tract to the circulating noxious factors of the uremic state The specific nature of the factors which produce the injury is not known but as a very general *clinical rule it can be assumed that sufficient* ulceration to cause serious gastrointestinal hemorrhage develops whenever the circulating urea nitrogen level exceeds 150 mg per 100 ml Unfortunately the technic of operating the artificial kidney necessitates heparinization of the patient thus adding considerably to the threat of gastrointestinal hemorrhage

There is no satisfactory treatment for the massive gastrointestinal bleeding which complicates uremia If it is possible to discover that the bleeding is really due to uremic ulcerations one must assume that the responsible lesions are widely scattered throughout the tract perhaps from stomach through rectum Local measures are of no avail and laparotomy must never be done Only control of the uremia can be expected to con*trol the bleeding But the uremic* patient can have other bleeding lesions too and it is a mistake to assume that the nature of the bleeding disease can be diagnosed from study of the blood chemistry In fact if the *patient already has a duodenal or gastric* ulcer development of uremia increases the chances of ulcer hemorrhage Even though this is ordinarily a desperately sick patient it frequently proves of positive therapeutic value to go to the usual *diagnostic effort* in order that a localized and treatable disease not be overlooked

FALSE AND FACTITIOUS BLEEDING

It is not uncommon for people who are well to notice something about their stools which leads them to believe they are bleeding from the gastrointestinal tract The anticancer crusade has made people aware of *their stools and whether that is good or*

fault The surgeon cannot necessarily expect to find the lesion he is treating even when it is possible to carry out a satisfactory gastrotomy examination through the proctoscope If the decision has been made to carry out this emergency measure the surgeon must be prepared to proceed even if the structures appear normal externally This is radical treatment and it involves reliance on shaky diagnostic statistical possibilities but often enough it proves to be life saving when severe hemorrhage cannot be controlled by medical means

A common problem is that presented by the patient who is known to have had several self limited bleeding episodes in the past and who now when the bleeding has stopped has normal clinical roentgenologic and endoscopic studies Even though none of the episodes was particularly severe this situation always demands definitive therapy If there is no history of hematemesis the diagnostic possibilities are legion When there is any chance that there is still a small amount of bleeding at the time the patient is studied it is well worth while immediately to carry out the Van Noate test so that at least the level of the bleeding lesion along the intestinal tract might be determined Unfortunately the presence of occult blood in the stools does not necessarily mean that bleeding is still active In this type of problem exploratory laparotomy can be expected to provide the diagnosis in about half the cases In almost all of these it will be possible to eradicate the lesion surgically for there are few diffuse diseases which can escape detection during detailed roentgenologic and endoscopic study Usually the answer is found in the small bowel in the form of a Meckel s diverticulum a hemangioma a connective tissue tumor or an adenoma One supposes that when surgical exploration fails to reveal a lesion the diagnosis is likely to be an isolated polyp or a primary ulcer of the jejunum

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which can well be mentioned at this point

Blood loss should be replaced just as quickly and fully as possible and this is ordinarily the first concern when serious hemorrhage is encountered Maintenance of normal blood volume does not carry any danger of aggravating hemorrhage and it is rather ridiculous to be afraid of the effects of blood transfusion on the bleeding patient For the one with chronic liver disease particularly every effort must be made to combat hypovolemia because even a small hemorrhage may prove sufficient to initiate hepatic decompensation Intra arterial transfusions have special physiologic virtues but they are rather impracticable except during emergency surgical procedures

Use of sedative and narcotic drugs during the early stages of gastrointestinal hemorrhage has unfortunately become a habit in some regions It is a misappropriation of the practice of using sedation when hemorrhage is due to trauma But in spontaneous gastrointestinal hemorrhage it is best to avoid all such drugs if it is possible Rarely restlessness may jeopardize therapy by causing intravenous needles to become displaced or by causing the patient to dislodge a Sengstaken tube Unless one knows with some certainty that the patient does not have significant liver disease it is most important that morphine not be used Morphine and other narcotics are dangerous for patients with cirrhosis and frequently enough they have been directly responsible for death If sedation is required there is no better drug for general use than paraldehyde

Whatever may be the source of bleeding the patient should be started on a diet which is close to normal as soon as nausea and hematemesis have stopped Experience from many quarters has shown that bleeding patients progress more satisfactorily when fed normally than when starved There is nothing to suggest that hunger contractions or the dyskinesias produced by blood in the stomach are kinder to a bleeding point than physiologic peristalsis It is easy to forget that the empty stomach is far from a resting stomach If treatment has not necessitated occlusion of the esophagus a liberal Meulengracht diet or some variation thereof should be used If a Sengstaken tube is in place constant gastric aspiration of the blood filled stomach is initially important in order to avoid nausea and vomiting which might dislodge the tube but after 48 hours it is almost always possible to begin feedings through the tube Most tube feeding formulas are so hypertonic that they encourage diarrhea and it is well worth sacrificing calories by diluting the formula at the start until the patient s reactions can be observed for a few days

TREATMENT WHEN THE SOURCE OF BLEEDING CANNOT BE FOUND

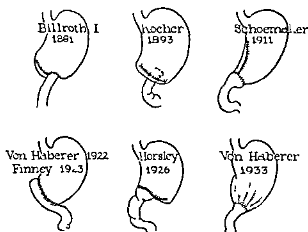
In a portion of cases the cause of bleeding is never discovered Sometimes even when bleeding proves fatal the most meticulous autopsy search fails to reveal the source It is not possible to explain why although it is certain that in most such instances the bleeding lesion is acute superficial and quick healing A reasonable expected rate of diagnostic failure cannot be stated because different patient sources vary so much in composition and because much depends on the conditions under which bleeding patients are managed

The question arises as to whether in the face of desperate upper gastrointestinal hemorrhage from a source which cannot be located after exhaustion of all diagnostic effort one is justified in recommending emergency laparotomy for blind subtotal gastrectomy if surgical exploration furnishes no diagnostic information The answer is often Yes This decision however must be made only after it has been proved by esophagoscopy that there is no bleeding disease in the esophagus The important mistake to be avoided is to carry out emergency gastrectomy when the responsible disease is esophageal varices If the esophagus is normal gastrectomy can be expected to furnish satisfactory emergency treatment for the majority of diseases which might be at

share of prejudice the excuse for including it is the need for more reviews through the troubled eye of the internist to help balance the many which are being presented through the bright sparkling eye of the surgeon

resurrected as desirable at a later date and others have had long spans of general usefulness followed by a gradual fading from the scene either because of accumulation of bad results or because theoretical objec

Billroth # I Operations



Billroth # II Operations

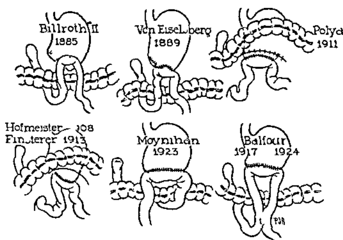


FIG 93 Nomenclature of certain varieties of subtotal gastrectomy following the interpretation of Black and Evert (3)

STOMACH OPERATIONS

Many many operative procedures have been devised through the years for removing parts of the stomach and for altering various physiologic functions of the organ in order to treat regional diseases Some have been quickly abandoned only to be

tions eventually arose out of better physiologic understandings The technology of gastric surgery is of no concern here but it is important to know the general anatomi alterations which are accomplished throug certain of the procedures At the present time the commonly employed definitive s

CHAPTER 9

STOMACH OPERATIONS AND THE POSTOPERATIVE STOMACH

There is no subject in gastroenterology which has elicited more verbal and printed information opinion and argument—and certainly prejudice—than the virtues and frailties of various stomach operations If after years and years of reading on the subject one is still a bit unclear about when and by what procedure a stomach should be operated upon he finds himself in good company Only to each individual essayist is the evidence convincing and the way for the future obvious It is easy to see why for the surgeon the problem is that of selecting the best among many good procedures and for the gastroenterologist it is a matter of selecting the least objectionable of the many bad available procedures It is difficult to understand how various operations could give such different results from clinic to clinic

Most of the controversy and confusion arises over surgery for the treatment of ulcer It can be dispelled to a large degree if one but maintains perspective regarding the relationship between the ulcer lesion and ulcer disease An operation can eradicate the lesion—the little manifestation—but it cannot cure the disease The results of an operation are governed much more by the continuing disease than by the mechanical derangements that the surgeon has made It is really not possible in fact to tell much about the weakness of stomach operations by studying their results among ulcer patients The most important thing experience tells about ulcer patients and surgery is that patients who respond least well to medical treatment respond least well to surgical treatment whatever the procedure

This subject seems proper enough for a medical discussion Although it adds to an overworked controversy and contains its

Postoperatively the immediate course is likely to be a little stormy because of tem porary gastric and duodenal dilatation This almost always clears spontaneously in about four days although by roentgen standards gastric emptying time may be prolonged for many weeks Temporary malfunction of the stoma is occasionally encountered and rarely anuria develops for a day or two About 15 per cent of patients have diarrhea for about two weeks Achalasia is an occa sional complication of vagotomy when the transthoracic approach is used as is com mon for the treatment of anastomotic ulcer There are no major complications and in almost all cases the gastrointestinal tract has settled down to clinical if not physiologic normalcy in two months

The surgical mortality rate of vagotomy and gastrojejunostomy is about 0 5 per cent Patient revaluation after three years reveals that satisfactory symptomatic results have been obtained in approximately 85 per cent of cases Ulcer recurrence is unusual after complete vagotomy New gastric ulcers have been reported and anastomotic ulcers are sometimes found but almost always in such cases the Hollander insulin test suggests an incomplete vagotomy Except for ulcer re currence the results of the Hollander test are not helpful in predicting the outcome of the operation Most patients gain 10 to 15 lbs Periods of postprandial rebound hypo glycemia are experienced by about 8 per cent of patients Persistent diarrhea is most un usual although often enough chronic con stipation is cured by the operation There are no significant side effects on pancreatic function It is sometimes said that vagotomy and gastrojejunostomy do so little to the stomach s anatomy that if it fails one can always go ahead and resect the organ how ever this is a rather poor recommendation for an operation

SUBTOTAL GASTRECTOMY

In many centers some variation of sub total gastrectomy is considered the best pro cedure for surgical management of duodenal ulcer and of gastric lesions which lie distal to the cardia and fundus Aesculapius is said to have begun the practice of cutting out ulcers about 400 B C and medical his tory since that time has shown quite clearly the necessity of such a procedure But after all this time there is still no agreement over the best technic Resection of part of the stomach makes the patient and his physiology quite abnormal and recommended procedural variations whose number is le gion have all been attempts to patch up local physiology as best the altered anatomy will allow The two major variations concern the manner of re establishing gastrointestinal continuity following distal resection the Billroth I type makes use of the cut end of the duodenum for gastric anastomosis and the Billroth II the side of the small bowel farther down Postoperative discom fort and nutritional problems increase in rough proportion to the amount of stomach removed but resection of at least 75 per cent is necessary in the treatment of duodenal ulcer in order to prevent recurrence of ulceration at the stoma (Fig 94) Unfor tunately it is usually quite impossible for the surgeon to tell just how much of the stomach he is removing and the pathologist cannot determine the point for him in retrospect Addition of vagotomy to gastrec tomy permits the saving of half of the stomach without compromising late results and for this reason the combined procedure is becoming an increasingly popular ap proach

Gastrectomy is said to provide effective therapy for duodenal ulcer because it inter rupts the hormonal phase of gastric secretion through eradication of the antrum and its secretory hormone gastrin One would think that when this had been done and the vagi transected besides gastric acid secretion would be well subdued and so it is But anastomotic ulcer continues to be a major postoperative problem and again it is clear that there is much more to ulcer genesis than acid

The surgical mortality rate for subtotal

gical procedures are vagotomy with gastro jejunostomy or pyloroplasty local excision of isolated lesions, subtotal *gastrectomy* of various extents with and without vagotomy and total gastrectomy Some of the anatomic varieties of gastrectomy are diagrammed in Figure 93 In a different category because they do not involve treatment of gastro duodenal disease or because they do not cause *important physiologic alterations* are such procedures as pyloromyotomy, diver ticulectomy gastrostomy cholecystogastros tomy and pancreaticocystogastrostomy

VAGOTOMY AND GASTROJEJUNOSTOMY

This is the most generally satisfactory op eration for duodenal ulcer when it is not necessary to remove the crater Because the lesion itself is not exposed or manipulated the operation cannot be relied upon to furnish adequate help in cases of ulcer penetration and it is entirely unsuitable for such com plications as active hemorrhage and spon taneous fistula formation But in the majority of duodenal ulcer patients who eventually are managed surgically the indications are either inadequate symptomatic response to nonsur gical measures or a history of recurrent hemorrhage and then vagotomy seems to work a little better than gastrectomy In addition simple vagotomy by itself is the procedure of choice for management of many cases of stomal or anastomotic ulcer By no means does vagotomy always provide *the help hoped for in these situations* and many physiologic technical and clinical prob lems surround its clinical utilization In the case of anastomotic ulcer for instance if the stoma is not already adequate it will be made worse by vagotomy Furthermore often an anastomotic ulcer has a fistula associated with it or at least has heavy adhesions about it and these require direct surgical treatment

One of the things vagotomy accomplishes is interruption *of cephalic influence over* gas tric secretion and the procedure was origi nally worked out with this as its purpose It cannot necessarily be assumed however that the operation is effective because of post operative change in the secretory pattern *for the vagus nerves control much more than* gastric secretion Vagotomy also decreases the tone of the muscularis propria prolongs gastric retention and depresses certain gas tric vasodilator responses Following com plete vagotomy gastric secretion returns to preoperative levels in some patients without *noticeable change in the clinical course* Upper gastrointestinal motility becomes nor mal again in about 75 per cent of patients within one to four years The eventual fate of altered vascular responses is unknown but it may well be here that the prolonged effectiveness of the procedure lies

Vagotomy is a difficult operation The success of the venture depends on the com pleteness of nerve section Because vagotomy induces gastric hypotonia it must be com bined with a gastric drainage operation except when it is used to treat anastomotic ulcer therefore the nerves must be attacked via the abdominal approach. In addition to the difficulties the surgeon encounters in subdiaphragmatic exposure of the cardia in some patients he must deal with many anatomic variations in the distribution of the vagal trunks and associated filaments Some of the nerves course rather deeply in th walls of the terminal esophagus and cardia Only a portion can be identified visually so it is necessary to carry out meticulous palpatory dissection if all branches are to be *divided Following resection of* as much of the nerve tissue as practicable the nerve ends are crushed by application of silver clips to discourage regeneration Neurinoma formation is not a problem Gastrojejunos tomy appears to be the most satisfactory means of providing for gastric drainage although in some centers the surgeons prefer pyloroplasty It is seldom possible at the time of operation to judge the completeness of vagotomy but subsequent studies can be expected to show that an experienced surgeon has accomplished physiologically complete vagus interruption in about 90 per cent of his patients

Postoperatively the immediate course is likely to be a little stormy because of temporary gastric and duodenal dilatation This almost always clears spontaneously in about four days although by roentgen standards gastric emptying time may be prolonged for many weeks Temporary malfunction of the stoma is occasionally encountered and rarely anuria develops for a day or two About 15 per cent of patients have diarrhea for about two weeks Achalasia is an occasional complication of vagotomy when the transthoracic approach is used as is common for the treatment of anastomotic ulcer There are no major complications and in almost all cases the gastrointestinal tract has settled down to clinical if not physiologic normalcy in two months

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gastrectomy as treatment for duodenal ulcer ranges from 4 to 7 per cent It is considerably higher when cancer is the disease The main immediate postoperative problems are pulmonary complications ileus gastric retention and vomiting due to temporary closure of the stoma diarrhea bleeding from the stomach or anastomosis functional obstruction of the efferent jejunal loop and leakage from the duodenal stump Much rarer are phlegmonous gastritis necrotizing enteritis wound dehiscence liver abscess subphrenic abscess and acute pancreatitis



FIG 94 Good postoperative function following extensive resection and Polya type anastomosis

Although statistics cannot give a clear picture of postoperative morbidity it is fair to say that approximately 40 per cent of patients have significant chronic postoperative problems and among the duodenal ulcer group about 25 per cent are displeased outright with the results The main problems are pains and dyspepsias of many sorts weight loss poor nutritional status anemia and anastomotic ulcer There are others as will be discussed a little later The rate of ulcer recurrence can be considered high whatever the details of the operative technic It is the observation of many experienced gastroenterologists that the Billroth I operations as compared to the Billroth II are followed by better symptomatic results less weight loss and fewer ulcer recurrences

TOTAL GASTRECTOMY

Total gastrectomy only recently urged as a means of increasing the success of surgery for gastric cancer has rather suddenly been abandoned for this purpose It too has proved impotent and it has been accompanied by such prohibitive mortality and morbidity rates that its trial period was

necessarily a short one Total gastrectomy is not likely to be revived as a means of treating gastric cancer but now and again under unusual circumstances the occasion arises for utilizing the procedure It cannot be given up altogether

There are many ways of re establishing gastrointestinal continuity following total gastrectomy It has been found that postoperative results particularly nutritional alterations

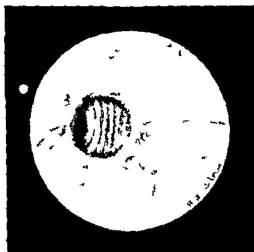


FIG 95 Gastroscopic view of healthy appearing stoma following subtotal resection The stoma is open and a portion of one of the jejunal loops can be seen

are least objectionable if duodenal exclusion can be avoided Jejunal or colon grafts between esophagus and duodenum are usually used Colon seems to have advantages However the connections are made the anastomotic line at the esophagus is very vulnerable for many days The most common cause of operative death is immediate dehiscence of the anastomotic sutures leading to both peritonitis and hemoperitoneum Iron deficiency anemia may develop soon after operation from the continuous bleeding of erosive esophagitis The esophagitis which develops after total gastrectomy is sometimes very severe and regularly very chronic Stricture formation at the anastomotic line is a regular complication but it is not necessarily progressive

The complex physiologic problems which always follow total gastrectomy are sometimes sufficient to cause total incapacity It is interesting that elderly people are considerably less likely to be subjectively disturbed than young people and advanced age should not be a great deterrent in making the decision for the operation The agastric syndrome is marked by disturbance of the total metabolism resulting primarily in severe weight loss and anemia The absorptive insufficiencies include carbohydrates as well as fats and proteins Alimentation time is decreased and there is postprandial diarrhea Rebound postprandial hypoglycemia causes important subjective problems Hematologically megaloblastic anemia develops after a few years This responds fairly well to vitamin B_{12} therapy

SPECIFIC POSTOPERATIVE PROBLEMS

It is easy of course for the gastroenterologist to develop a distorted impression of the frequency of postoperative problems because he has the opportunity to examine only a portion of the patients who get along well after operation On the other hand the surgeon has the chance to examine only a portion of those who do poorly As pointed out elsewhere in the case of ulcer patients the postoperative prognosis is often predictable prior to operation It is considerably worse than the prognosis of patients who are operated upon for other diseases In general young people have more severe chronic postoperative problems than old and their disabilities are of much more social concern There is no known cure for the patient who has no specific postoperative problem but who just does not get along well after operation

DUMPING SYNDROME

This complication seems to occur to some degree in approximately 25 per cent of patients who have had surgical manipulation of the gastric emptying mechanism although incidence figures are a bit confused by shading off of its manifestations into the great

number of other postoperative syndromes The type of operation performed does not have great influence over the expectancy severity or persistence of the complication but the disease under treatment does The dumping syndrome occurs almost exclusively in patients who have had surgery for either duodenal ulcer or gastric ulcer It is rarely encountered following resection for neoplasm Reported incidences for different operative procedures vary considerably of course but in actual practice it is not possible to become convinced, for instance that Billroth I operations have any particular advantage over Billroth II operations in this regard or that adding vagotomy to gastrectomy is an effective prophylactic measure It is important to note that about 4 per cent of duodenal ulcer patients who have had no operation have the classical dumping syndrome and that some nervous people without any organic disease have rapid gastric emptying accompanied by dumping symptoms There is no age or sex predilection except that which is governed by the nature of the disease for which operation is done

The syndrome is characterized by brief postprandial attacks of various systemic symptoms and signs which are reminiscent of the manifestations of hypoglycemia They usually appear within a few weeks of operation after a normal diet has been resumed Occasionally there is a lag of a year or more prior to onset Attacks do not follow every meal but tend to be unpredictable In almost all patients the symptoms begin towards the end of or immediately after eating while in the others from 10 to 30 minutes elapse before the attack begins The patient rather suddenly develops a nervous weak feeling becomes warm all over breaks into a sweat and then feels faint and dizzy Often there is headache and a sensation of hunger The patient wants to lie down and when he does there is almost always quick relief of most of the symptoms Epigastric fullness and nausea however may persist for a while If the patient cannot lie down the symptomatic period lasts from a few minutes to an hour Examination during an attack reveals flushing and sweating tachycardia and blood pressure readings which vary considerably from minute to minute More detailed studies show that there is eosinopenia and patternless variations in cardiac output and minute volume Depression of serum potassium with characteristic electrocardiographic changes is sometimes found

It is probable that both jejunal distention and hypoglycemic rebound play parts in creating the dumping syndrome possibly the former being largely responsible for instances of immediate dumping and the latter for delayed attacks It is clear that quick emptying of the gastric contents is a prerequisite It is also clear that dumping symptoms are more frequent and more severe when iron deficiency anemia is present The usual explanation seems to be that when a meal is spilled quickly into the jejunum it and the water drawn from the jejunal walls by its hypertonicity cause bowel distention resulting in the autonomic stimulation necessary for production of the manifestations Fluoroscopically the patient s stomach behaves like an esophagus and his jejunum like a gastric reservoir In addition to stomal incontinence there are atony and dilatation of the upper jejunum and sometimes hypertonicity of the ileum Although the severity of these roentgenologic alterations may not correlate well with the severity of the symptomatic picture intermittent rapid transgastric flow is always evident Dumping symptoms can be produced in some people both by sudden mechanical dilatation of the intact jejunum and by transtubal hypertonic flooding of the upper small intestine

Most patients with the dumping syndrome develop rebound hypoglycemia but usually the symptoms make their appearance during the period of hyperglycemia before the drop begins In some of those who have delayed attacks however there is no question that sudden drop in the blood sugar is responsible for the syndrome as can be demonstrated by quick clearance of all manifestations upon intravenous glucose injection Etiologic signi

ficance has been attached to hypokalemia by some although no protection against attacks can be provided through potassium supplementation An adrenal factor might be suggested by the eosinopenia but it is not clear how this could fit into the mechanism

The syndrome eventually proves self limited in most patients but it may cause misery for many months before it finally clears Meanwhile the patient needs help Immediate treatment of dumping symptoms is best implemented by having the patient lie down as he no doubt has already found out for himself This is easy but not always practicable or even possible and therefore the important aspect is prophylaxis Iron deficiency must be corrected A small proportion of patients seem to be cured simply by eradication of their anemia Parenteral therapy is usually most satisfactory for this From what has been said about etiology it is logical to suppose that most help will come from eating very slowly and this is so for many patients It must be remembered that it is not possible to control the fluid content of the jejunum merely by withholding fluids from the diet One must not advise dry meals because their hypertonic osmotic effects defeat efforts to reduce jejunal distention It is far better to utilize a hypotonic regimen with liquids to be taken freely with the meals Influx of fluid from the bowel wall is not prevented thereby of course but distention is discouraged because the meal is better distributed through the small intestine before this occurs Simple sugars should be eliminated in favor of complex carbohydrates Other than this diet composition should not be much interfered with because under nutrition often is or will shortly be a problem at the time the dumping syndrome presents itself Dumping can al o be prevented by binding the abdomen tightly —too tightly for comfort most patients find Antispasmodics are not helpful but symptoms can be blocked effectively in some patients by phenyl ethyl methyl hydantoin (Mesantoin) in doses of 0 1 gm one hour before meals There is however a toxicity risk It is best to handle the problem by alterations in the feeding habits

AFFERENT LOOP SYNDROME

This rather rare syndrome is to be distinguished carefully from other postoperative troubles because it is amenable to specific therapy It is a complication only of Billroth II type operations In contradistinction to acute obstruction of the afferent loop which is quite a different problem this is a chronic recurrent syndrome It is due to partial or recurrent obstruction of the afferent loop caused by adhesions traction exerted by the colon recurrent partial volvulus or partial internal herniation of the loop As a result the pancreatic and biliary secretions collect at intervals within the obstructed segment leading to distention and symptoms

Attacks ordinarily begin about 15 minutes after completion of a meal There is nausea and a sickening feeling of fullness in the upper abdomen There is no actual pain and it is rare for there to be any of the systemic effects which are characteristic of the dumping syndrome After about half an hour the patient begins to vomit and this brings complete relief until the next time Up to a liter of vomitus may be produced Because the food just eaten will already have passed on down the efferent loop the vomitus consists only of thin bile fluid It represents the accumulated contents of the afferent loop which has suddenly emptied spontaneously into the gastric stump to end the episode

The diagnosis is largely a clinical one The progression of events is quite similar from attack to attack and the mechanics of the problem are usually evident from the dramatic vomiting phase The roentgenologist finds that reflux into the afferent loop does not occur during an attack At other periods it may or may not as is the case with any patient who has had a Billroth II type of operation In addition suggestive information may be obtained through failure to recover bile by gastric aspiration following a fat meal provided the meal has set off a characteristic attack

Effective treatment requires surgical eradication of the obstructive factor The method chosen can seldom be predicted prior to exploration

ANASTOMOTIC ULCER

An anastomotic (stomal jejunal) ulcer may develop after any operation by which the jejunum is hooked to the stomach whether or not there has been a gastrectomy or a vagotomy To the gastroenterologist this is a moderately common problem whatever operation his surgical colleagues have the habit of using Surveys of anastomotic ulcer incidence following various types of operation show a confusing degree of difference from clinic to clinic The true incidence is very difficult to determine because some *anastomotic ulcers do not appear until many* postoperative years have elapsed long after the patients have been dropped from reckoning in surgical series There have been few proposed variations on the gastrectomy theme which were not intended at least in part to discourage postoperative ulceration but none has been entirely successful Anastomotic ulcer may develop even though repeated studies suggest that the operation has effected permanent achlorhydria To be sure many *technical details such as the short afferent* duodenojejunal loop have frequently been reaffirmed as important for discouraging formation of anastomotic ulcer The emotional influences which are much the same as those governing duodenal ulcer seem important etiologically and it is interesting to note that anastomotic ulcer is far commoner among patients who have been operated upon for duodenal ulcer than among those whose initial disease was gastric ulcer or gastric tumor

A different type of ulcer sometimes forms when a suture which has inadvertently been placed through the gastric mucosa is retained to act as a source of mucosal irritation Ordinarily nonabsorbable sutures used in making an *anastomosis are extruded into* the bowel lumen within several weeks or a few months of operation Their retention causes no trouble unless the mucosa has been enclosed by a loop There are always erosions about such sutures and actual chronic ulceration sometimes develops (Fig 96)

About 85 per cent of anastomotic ulcers form in the efferent loop of jejunum just distal to the line of anastomosis The others *form on the gastric side close to the anastomosis* Sometimes they cross over to become gastrojejunal ulcers The great majority remain smaller than 1 5 cm in diameter but all including the very small ones show a



FIG 96 During gastrojejunal anastomosis three years previously this cotton suture had inadvertently been passed through the mucosa and had remained in place as a slack loop Gastroscopic examination showed this ulcer beneath it plus erosive gastritis in the area The jejunal mucosa appears normal

tendency to burrow deeply Multiple ulcerations are uncommon in the vicinity of a stoma although multiple erosions are not

Complications are frequent and characteristically they are severe An ulcer at a gastroenteric anastomosis is more likely to bleed than any other type of ulcer Both repeated massive hemorrhage and slow continuous blood loss are common Recurrent bleeding can be expected whenever there is a retained suture Free perforation is discouraged by local reaction and adhesions about the area of anastomosis and it is not nearly as much

of a problem as is penetration Most neglected anastomotic ulcers eventually penetrate into the surrounding adherent omentum and mes enteries Internal fistula especially gastrojeju nocolic fistula is an important complication Chronic obstruction at the stoma secondary to ulcer reaction is fairly common

Clinically the manifestations of anastomo tic ulcer are the same as those of any gas troduodenal ulcer If the patient was origi nally operated upon for ulcer his symptoms are usually such that he believes his old ulcer has returned During the hunger periods there is epigastric pain usually helped by intake of food Night pain is not especially common Vomiting is a frequent problem due ap parently to recurrent spasm and edema which cause partial obstruction Penetration does not cause back pain but instead intensifica tion of the existing symptoms

Diagnosis is usually suspected at once from the clinical picture The clinical impression is very important Although confirmation if it is to be had must be based on roentgen ologic and gastroscopic findings often it is not possible to demonstrate the lesion Roent genologically the ulcer can be detected in only about half the cases This is a region of many postoperative deformities contractions and bowel overlappings and the radiologist finds interpretation very difficult in many pa tients The gastroscopist can ordinarily find and identify anastomotic ulcers which lie on the gastric side but he can only see those jejunal ulcers which happen to lie in the small segment which is visible through the stoma (Fig 97) Free suture can be diagnosed only by gastroscopic examination Ordinarily a mucus encased loop of black cotton with a little slack is seen crossing an eroded or ulcerated area of gastric mucosa close to the stoma

Not often does it prove profitable to treat an anastomotic ulcer by medical means Once an ulcer forms persistence or quick recur rence is the rule unless aggressive therapy is carried out The potential complications con stitute an unusually serious threat in this dis ease Transthoracic vagotomy gives excellent results in many cases but the possibility that local penetration with extensive adhesive re action has occurred ordinarily encourages an abdominal approach for subdiaphragmatic vagotomy and revision of the anastomosis Al though many surgeons prefer to carry out gastrectomy if that has not already been done or further resection it is doubtful if mere sacrifice of stomach tissue by itself in creases the chance of permanent cure of the patient who already has demonstrated ability to develop an anastomotic ulcer

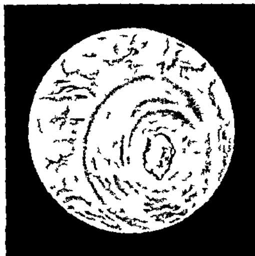


FIG 97 Gastroscopic view of anastomotic ulcer which lies about 3 cm distal to the stoma Only by chance can the gastroscopist see anastomotic ulcers which do not lie on the gastric side

FISTULAS

Both external and internal fistulas although rare are important postoperative complica tions The first develops as a result of leakage from the duodenal stump or from the anasto mosis Such leakage usually leads to peri tonitis or acute local abscess but sometimes instead it pushes up quickly through the in cision to open on the abdominal wall as a fistula There is no technic for closing and burying the duodenal stump which can be counted upon to preclude fistula formation The usual explanation for breakdown of a suture line is ischemic necrosis secondary to unavoidable operative devascularization

There are a great many anatomic variations among the distribution patterns of the pancreaticoduodenal arterial arches and sometimes there is no way for the surgeon to recognize the degree of local ischemia his manipulations may be causing Often he has very little duodenal tissue to work with in making the closure and if there is a duodenal ulcer its edge may have to be incorporated in it Because tissue frailty is the problem it is well to remember that an ulcer patient who has subsisted for a long time on little more than milk and cream is so deficient that he may have no detectable ascorbic acid in his blood The warning regarding routine preoperative supplementation is obvious

Cutaneous fistulas usually open between the third and seventh postoperative days Small ones may eventually close spontaneously If they are going to they will but there is little that can be done to help Persistent cutaneous fistulas are very very difficult problems and the eventual mortality rate is rather high A fistula causes such an assault on the nutrition that it cannot be permitted to persist The surgeon may be able to eradicate it

Internal fistulas usually develop much later from a month to many years after operation They are secondary to penetration of an anastomotic ulcer and many anatomic varieties can result Gastrojejunocolic fistula is most common among those which cause important clinical problems although not all are responsible for severe manifestations Mechanically this form of fistula behaves in strange ways especially because ingested material does not usually pass directly from jejunum to colon The common symptomatic triad consists of diarrhea fecal vomiting and weight loss Vomiting is least common of the three A diarrheic stool often immediately follows each meal but it is unusual to find grossly recognizable food in it The most characteristic picture is that presented by the patient who had gastric surgery long ago and who now develops diarrhea and suddenly begins to lose weight Specific diagnosis must be made by barium enema fluoroscopy The fistula often cannot be demonstrated when the barium suspension is ingested and one can only wonder why this should be Treatment involves more than surgical eradication *of the fistula, for something surgically must* be done to discourage development of another anastomotic ulcer In addition to resection of the fistula and jejunoplasty with or without more radical gastrectomy subdiaphragmatic vagotomy is usually done Even then the fistula later recurs in about 10 per *cent of the patients*

POSTOPERATIVE GASTRITIS AND JEJUNITIS

From the time of operation the gastric mucosa becomes abnormal and in almost all patients in whom a gastroenterostomy has been made with or without gastrectomy it *remains abnormal indefinitely* The mucosal process which persists is chronic degenerative gastritis It is a diffuse process characterized by chronicity the histopathologic picture being that of the regenerative phase of degenerative gastritis for months and years The process of regeneration which goes on in the neck stratum keeps precise pace with local necrobiosis It is such a static reparative process that it hardly ever progresses to atrophic gastritis The only influence common to *the results of operation which might act as* the etiologic factor in postoperative gastritis is the presence of a stoma between stomach and small intestine Addition of vagotomy to the operation seems to protect to some extent against gastritis Spontaneous rhythmicity at the stoma with its discouraging influence over trans stomal reflux from the jejunum does not prevent gastritis Postoperative gastritis does not cause symptoms It is however very susceptible to erosion and the important *clinical consequence is bleeding*

Diagnosis of postoperative gastritis is conveniently made either by gastroscopy or by peroral gastric mucosal biopsy During the first two or four weeks after an operation on the stomach gastroscopic examination regularly shows acute generalized inflammation of the mucosa with edema hyperemia and exudate The endoscopic picture is striking but biopsy specimens reveal that the process

is superficial being limited to the mucosa s neck and foveolar strata Later the gross changes become much less blatant but histopathologically it is found that chronic disease has meanwhile become established

There is no known way to eradicate postoperative gastritis It is a subclinical process requiring no treatment when uncomplicated Hemorrhage may be very severe its treatment is the same as that for other forms of erosive gastritis

Phlegmonous gastritis quite a different problem is a rare immediate complication of gastric surgery secondary to bacterial infection of the gastric wall

Jejunitis is a much less common postoperative complication than chronic gastritis Usually the jejunal mucosa remains normal even though the gastric mucosa is severely diseased Jejunitis involves the efferent loop and sometimes the afferent for several centimeters distal to the stoma It can be diagnosed clinically best if the vacuum biopsy tube can be passed on through the stoma into the jejunum for a biopsy specimen Sometimes jejunitis can be recognized easily through the stoma upon gastroscopic examination but the area of jejunal mucosa which can be visualized is usually very limited Although the gastroscope can often be passed through the stoma and down into the jejunum not much can be seen when it is and this is a dangerous maneuver Postoperative jejunitis is not believed to have significant clinical consequences unless there be an associated jejunal ulcer

TROUBLES AT THE STOMA

Immediately following gastrojejunostomy it is not uncommon for the stoma to become completely obstructed a postoperative complication usually referred to as delayed opening Gastroscopic examination in such cases shows tremendous edema and superficial inflammation over the area of the stoma In almost all instances spontaneous opening occurs in from one to three weeks if the stomach or gastric stump is kept empty by constant aspiration A great amount of patience is required of patient family and doctor in order that conservative management be given a chance It almost always proves to be a mistake to re-explore the anastomosis before three weeks have passed because despite fears it is found that the first operation was correctly carried out and that nothing can be accomplished except perhaps to pass a feeding tube into the jejunum

Functional obstruction of the efferent jejunum just below the gastrojejunal stoma is a less frequent and less troublesome problem Usually it develops during the second postoperative week It is manifested merely by a few days of nausea vomiting and uncomfortable fullness Simple jejunal spasm seems to be at fault as judged by roentgenologic study It clears spontaneously without help If there is gastric atony immediately after operation the use of 5 or 10 mg of Urecholine before meals seems to prevent this type of jejunal problem in addition to encouraging gastric emptying

Chronic stomal troubles depend to a great extent on the technic used in making the anastomosis The mysteries of this are supposed to be withheld from all but stomach surgeons but perhaps a few generalities may be permitted The functional diameter of the lumen of a gastrojejunal anastomosis depends entirely on the diameter of the efferent loop itself and has nothing or very little to do with the size of the hole between stomach and small bowel In selecting the site for anastomosis the length of the afferent duodeno-jejunal loop must be made as short as the local anatomy will permit both as a deterrent to formation of anastomotic ulcer and as an important gesture towards prophylaxis of postoperative undernutrition The stoma is fashioned at the part of the stomach or gastric stump which is most dependent when the patient is upright In addition to being in effective in draining the stomach a high stoma may encourage pyrosis regurgitation and anorexia When a palliative gastroenterostomy is made in order to relieve obstruction secondary to gastric cancer it of course must be placed wherever the surgeon is able to find

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flux Prograde prolapse of the gastric mucosa through the stoma occasionally is observed upon roentgenologic examination but it like retrograde prolapse seems to have no clinical significance Rhythmic closure of the stoma quite independent of gastric peristalsis sometimes develops and sometimes does not for

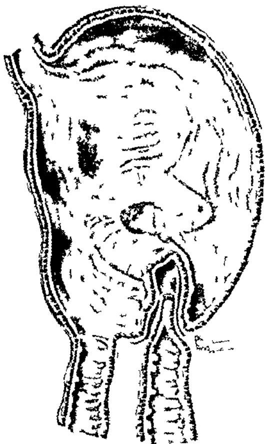


FIG 99 Anatomic relationships at onset of jejunogastric intussusception

reasons unknown Little defects produced at the stoma at the time of operation such as tags and profile irregularities persist indefinitely

JEJUNOGASTRIC INTUSSUSCEPTION

Retrograde intussusception of a portion of the jejunum through the gastrojejunal stoma into the stomach is an important mechanical disease of the postoperative stomach (Fig 99) Several configurational varieties are possible with either or both jejunal loops taking part Intussusception may begin just below the stoma or the intussusceptum may migrate through a considerable length of jejunum before it enters the stomach Only the stoma may be locally plugged or a huge mass of invaginated jejunum may fill the stomach or stump as far as the cardia The cause for intussusception is not known but presumably involves complex dyskinesias which include antiperistalsis Rarely an intramural tumor of the jejunum initiates the process

Jejunogastric intussusception takes two clinical forms acute obstruction and chronic recurrent obstruction In the acute obstructive type there is sudden severe cramping pain at first localizing to the upper abdomen later spreading to the chest back and hypogastrium The patient characteristically feels faint nervous and frightened There is vomiting initially and retching later Sometimes there is hematemesis In about half the cases a mass can be outlined by palpation in the epigastrium There are no peritoneal signs The attack lasts from two to many hours It may end suddenly without outside interference but this cannot be anticipated Death may result from hemorrhage gangrene of the bowel or the high obstruction itself Diagnosis depends largely on clinical awareness Fluoroscopy with a water soluble contrast medium is helpful and may show the characteristic striated or whirled pattern of jejunum within the stomach but examination is often very difficult because of the patient s intolerance to the contrast medium The need for emergency surgical help is usually apparent Manipulative reduction sometimes with resection of gangrenous jejunum is always indicated

Chronic recurrent intussusception manifests itself through periodic episodes of partial gastric obstruction The clinical picture however follows no special pattern There is always upper abdominal pain usually developing rapidly but not necessarily becoming severe Vague discomfort is perhaps more common Vomiting is usual Physical examination gives no explanation for the symptoms Diagnosis is the privilege of the roent



FIG 98 Recurrence of carcinoma at the anastomotic site with partial obstruction of the stoma and quick orad spread Resection for antral carcinoma had been done four months previously

uninvolved stomach wall and this must be as far from the spreading growth as possib e It necessarily may have to be high Cancer occasionally develops anew at a long standing stoma (Fig 98)

Stomal disease is well studied gastroscopically In addition to ulcer and invasion by cancer the important disease is chronic stomatitis This is a combination of local gastritis and jejunitis plus a unique degree of deep fibrosis Stenosis does not often become a problem unless there is an associated ulcer The main manifestation is continuous loss of small amounts of blood The surgeon is not able to create any sort of valve or sphincter mechanism at the stoma and in some patients trans stomal reflux proceeds in large amounts at irregular intervals It is frequently observed at gastroscopy that jejunal mucosa prolapses briefly into the stoma coincident with re

develops the Mallory Weiss syndrome is a possibility A little later acute gastric ulcer may develop bleed suddenly and quickly heal As time goes on anastomotic ulcer and gastritis are the most common sources

ANEMIA

Mild anemia is common following gastrectomy particularly among women This is blood loss from the postoperative stomach is likely to be greater in one sex than the other

Megaloblastic anemia due to vitamin B deficiency with the blood and marrow changes of pernicious anemia is almost inevitable following total gastrectomy provided the patient survives six years or longer It is rare after operations which leave a portion of the stomach remaining Some reports of low in

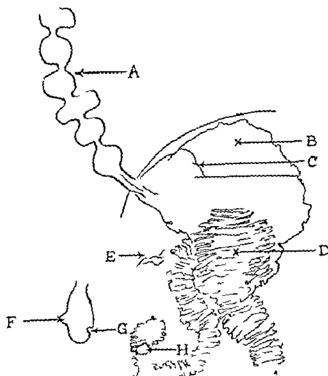


FIG 100 Some radiologic abnormalities of the upper abdomen *A* Curling of the esophagus *B* Magenblase and *C* shadow of carcinoma of the cardia occasionally detected fortuitously on a routine chest film or plain upright film of the abdomen *D* Jejunogastric intussusception *E* Calcium streaks in this position usually indicate calcification of the splenic artery *F* Simple diverticulum of the gall bladder *G* Polyp of the gallbladder *H* Roentgen configuration of normal papilla of Vater

hypochromic blood loss anemia and it has nothing to do with the intrinsic factor If the operation has decreased acid secretion significantly there may be in addition defective iron absorption This may be the explanation for the higher incidence among menstruating women for there is nothing to suggest that cidences of megaloblastic anemia following total gastrectomy are misleading because the patients were not studied long enough postoperatively The exact degree to which the intrinsic factor s source is eliminated through total gastrectomy is actually unknown because the small intestine may play a part in its

genologist who is able to identify invaginated jejunum in the stomach He finds that ob struction is only partial and the stomach or gastric stump may empty itself within an hour in spite of the intussusception Gastro scopic examination is helpful in diagnosis especially if the radiologist is not able to identify the intragastric mass

Treatment of the chronic recurrent form does not often call for surgical intervention At operation it is possible to do little more than revise the anastomosis and hope that this will discourage further intussusception The jejunal loops cannot of course be fixed or otherwise held in position The episodes are self limited and apparently acute ob struction is not a likely possibility in this form Use of Urecholine before meals has an effective prophylactic action in some cases and should be tried

NUTRITIONAL PROBLEMS

To a large portion of patients who have had a stomach operation nutritional problems are the most important of the adverse con sequences Rapid weight gain following major gastric surgery is so unusual that it makes a demand for study regarding the possibility of unrelated disease Weight loss is usually rapid the first few weeks after gastrectomy The weight then tends to level off but there after the patient finds he cannot gain An unsatisfactory weight trend is particularly striking among patients who at the time of operation are underweight no matter what surgical procedure is done Probably 75 per cent of patients who are operated upon for ulcer are below their normal weight at the time The patient who is overweight fares much better and although there may be loss of perhaps 20 lbs the static level at tained leaves him in a good nutritional posi tion Surgeons like to operate on lean people but if gastrectomy is contemplated an im portant postoperative complication can be somewhat ameliorated by insisting on a sub stantial weight gain ahead of time

There is no question but that the important etiologic factor behind postoperative under nutrition is simple insufficient food intake Far from the mysteries of complicated meta bolic derangements or enzymatic insufficien cies the fact is that the patient does not eat A major portion of the appetite apparatus has been removed or it has been rendered im potent Although it is true that fat absorption is somewhat defective following gastrectomy and that fecal fat may be increased over normal these do not amount to very much Excessive stool nitrogen loss is distinctly un usual following subtotal resection All in all neither unfavorable balances nor altered metabolism can be blamed for the patients inability to gain weight

It is particularly important that the patient who has had a stomach operation be placed on a normal diet just as soon as practicable perhaps in two weeks Man has never devised a diet which is more acceptable and more helpful to the stomach and the whole body in health and disease than the normal diet

HEMORRHAGE

Hemorrhage of major proportion recur rent grossly recognized bleeding and con tinuous occult loss of blood are common postoperative complications In some patients this is a problem only during the immediate postoperative period but in others it may continue for years There are a great many possible explanations any time there is bleed ing from the postoperative stomach and therapy can be carried out intelligently only if a vigorous diagnostic approach is utilized The individual diseases are discussed else where and will only be listed here The com mon explanations during the first two weeks after operation are a free artery at the site of anastomosis acute erosive gastritis and acute erosive esophagitis Both gastritis and esophagitis may persist indefinitely with re current erosion Unassociated esophageal varices may be present and they may begin to bleed as a result of erosive esophagitis Acute erosive gastrojejunal stomatitis probably is always present for the first few postopera tive weeks If temporary stomal obstruction

CHAPTER 10

JEJUNUM AND ILEUM

INTRODUCTION

The jejunum and ileum are charged with most of the absorptive phase of the body s metabolism In addition to falling heir to the familiar types of visceral affliction such as the infections and tumors they cause a unique group of illnesses when they are unable to carry out efficiently this initial stage of nutrition To the clinician the jejunum and ileum are characterized by relative diagnostic inaccessibility As mesenteric organs their intrinsic pains do not become well localized and their masses are often too mobile to permit identification of origin through palpation Unless there be a surgical gastroenterostomy jejunostomy or ileostomy the small intestine cannot be reached endoscopically For morphologic diagnosis help can be obtained only by roentgenologic examination and this is a difficult area for the radiologist For pathophysiologic diagnosis rather difficult metabolic studies are necessary and often the results must be rejected because they are at variance with the clinical facts

But the small intestine is coming up in the gastroenterologic world and intense interest during the past several years in both its abnormalities and in the technology of diagnostic approach has resulted in elucidation of satisfactory means for handling most of its diseases

DIVERTICULOSIS

The jejunum and ileum are moderately unusual sites for development of acquired diverticula The former segment is more likely to be affected than the latter and the proximal jejunum is most often involved (Fig 101) The autopsy incidence of jejunal diverticula is about 0 6 per cent In most cases duodenal or colon diverticulosis also exists Usually two or three diverticula are present although

manufacture Treatment with vitamin B produces optimum response in most patients

TUBERCULOSIS

New and reactive pulmonary tuberculosis is too commonly encountered following gastrectomy to be explained on the basis of coincidence The reported incidence has varied in different parts of the world but the tendency has been considered significant in most quarters Reports of incidences as high as 10 per cent indicate a most unusual experience to be sure and it is to be noted that clinicians in this country have not been as impressed by the association as have observers in other parts of the worwld Tuberculosis apparently shows no special tendency to follow vagotomy and gastrojejunostomy

When tuberculosis behaves this way it usually is recognized within two years of the operation Probably the nutritional problems created by resection are responsible for establishment or reactivation of the infection Therapy of the tuberculosis is frequently made difficult by marked intolerance of the post gastrectomy patient to para amino salicylic acid

OTHER POSTOPERATIVE PROBLEMS

Pseudomembranous enterocolitis which is discussed elsewhere is a rare complication of gastric surgery It makes its presence known about two days postoperatively by diarrhea circulatory collapse and often death

Mild generalized demineralization of the bones can be detected eventually by careful study in about *20 per cent of people who* have had subtotal gastrectomy It rarely becomes of clinical importance

Depression or cessation of sexual activity is reported by *about one third of men who* have a gastrectomy This is not so much a matter of impotence as decreased libido There may be an association with the anxieties or mental depressions which are sometimes encountered after many types of major surgery

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the omphalomesenteric duct in failing to become obliterated could give rise to a structure much longer than 10 cm Some very long Meckel s diverticula have been described but it is probable that these represented enterogenous cysts

diverticulum is attached directly to the umbilicus the diverticulum opens as a fistula at the umbilicus and a cord connects the diverticulum with some other structure

In about 80 per cent of cases the lining is normal ileal mucosa In the rest there is



FIG 102 Rare instance of multiple diverticulosis of small intestine This was a subclinical condition in this patient as it usually is

The classical form of diverticulum making up about 65 per cent of the lesions is simply a blind branch from the side of the ileum without attachment at its end but sometimes with a small mesentery In about 15 per cent of cases the end is connected to the umbilicus by a short cord which represents the atretic distal portion of the duct Less common varieties are those in which the end of the

heterotopic mucosa distributed as islands or covering most of the inner surface Sometimes there is more than one type represented Gastric pancreatic duodenal and colonic epithelium are the most common It appears that any of these may prove to be weak areas in the continuity of the diverticular wall becoming responsible especially for ulceration and bleeding

they may not be close to each other In rare instances there may be a couple of hundred (Fig 102) They usually originate from the mesenteric border A diameter of 1 or 2 cm is common The muscularis propria ordinarily does not completely enclose the sac

These are usually subclinical lesions It is possible for acute diverticulitis to develop with abscess formation and perforation but this is very rare Intussusception and volvulus secondary to jejunal diverticulosis are curiosities Hemorrhage has been described Roentgenologic examination is successful in demonstrating only about one of five cases The great majority are found only incidentally at autopsy and then only if a search is made

MECKEL S DIVERTICULUM

The fetal vitelline (omphalomesenteric) duct persists after birth as a Meckel s diverticulum in about 1 per cent of people who reach adulthood The incidence is often stated to be higher than this but if it is it cannot be proved at autopsy Males are affected about twice as often as females The diverticulum arises from the antimesenteric side of the ileum usually about 75 cm proximal to the ileocecal valve with variations in location up to 50 cm on either side of this point Its diameter is less than that of the relaxed ileum and its length usually is less than 10 cm in the adult There is no embryologic information which would permit one to suppose that



FIG 101 Multiple diverticula of jejunum arising at usual site There are in addition two large duodenal diverticula

mors are likewise rare Tuberculosis and actinomycosis have been reported Adenocarcinoma and enterocystoma are pathologic curiosities Argentaffinomas of Meckel s diverticulum hardly ever metastasize

Diagnosis of the various complications of Meckel s diverticulum is discussed elsewhere under the specific entities Unless some sign of trouble is observed about the umbilicus such as a fistula or cellulitis diagnosis of the diverticular associations must depend entirely on clinical suspicions Roentgenologic demonstration of a Meckel s diverticulum is a stroke of rare fortune

Treatment of all complications except tuberculosis involves surgical extirpation of the diverticulum plus whatever else seems advisable to the surgeon at the time Because detection of the diverticulum in cases of complication almost always comes only at laparotomy many an operative plan must be altered at this finding In general it may be said that amputation of a Meckel s diverticulum should routinely be considered as a prophylactic gesture whenever one is encountered during abdominal exploration

INTESTINAL OBSTRUCTION

Obstruction of the jejunum or ileum is a process devoid of any element of charm Although it is largely a mechanical problem there is more art than science to its proper management Possibly it is the complexity of abnormal physiologic responses which renders the artistic approach to evaluation and therapy more successful than the mechanical approach At any rate the importance of the whole patient problem is paramount and the slide rule cannot be looked to for answers to the many metabolic questions which may arise

The causes of obstruction of the small intestine are many Some may operate at other levels to cause obstruction of the duodenum or of the colon as well as the jejunum and ileum Approximately 90 per cent of mechanical small bowel obstructions occur in the ileum The following etiologic classification is much like others which are widely used and which seem to satisfy most clinicians

- I Mechanical causes of narrowing
  - A Strictures
    - 1 Congenital atresia septa
    - 2 Acquired inflammatory neoplastic traumatic
  - B Obturation
    - 1 Natural bodies gallstones enteroliths fecal impaction meconium ileus
    - 2 Foreign bodies bezoars worms barium stones hardware etc
  - C Compression from without
  - D Fibrous constrictions
    - 1 Congenital bands
    - 2 Acquired adhesions
  - E Hernias
    - 1 Internal
    - 2 External
  - F Volvulus
  - G Intussusception
- II Nervous (paralytic ileus)
  - A Peritonitis
  - B Traumatic shock fractures etc
  - C Systemic infections pneumonia encephalitis etc
- III Vascular
  - A Mesenteric thrombosis
  - B Mesenteric embolus

Acquired adhesions usually secondary to abdominal operation are by far the most important cause of small bowel obstruction producing approximately half of the cases Incarceration of the bowel in a hernia usually external comes second It is well to remember that in general the smaller a hernia is the more likely it is thus to be complicated The obturation types account for only a small proportion of obstructions The small bowel is so mobile that simple compression by extrinsic lesions is most unusual except when there are bowel adhesions Malignant tumors of the female pelvis are the usual cause

MECHANISMS OF CERTAIN SPECIFIC TYPES

Congenital defects of many sorts such as atresia and septa are capable of producing obstruction from the time of birth In addition certain defects may remain latent until later

The clinical importance of Meckel s diverticulum lies entirely in its many complications The pouch of itself causes no symptoms It is very difficult to know what proportion *sooner or later becomes complicated* Autopsies are done on a select group of people Perhaps 5 to 10 per cent might be a fair guess If a Meckel s diverticulum is going to become complicated it is likely to do so *within the first six or eight years of life* and very few come to light after the fourth decade

Mucosal ulceration and hemorrhage are by far the most common threat In almost all *instances the presence of ectopic mucosa can* be proved if tissue becomes available for examination Gastric mucosa seems to be especially important as a *locus minoris resistentiae* although it is a mistake to assume *automatically that its secretions play a causal* role Bleeding may be very severe and this can be considered one of the major causes of important gastrointestinal hemorrhage in the pediatrics age group

Acute diverticulitis develops as a result of obstruction at the diverticular stoma with confined infection just as does diverticulitis elsewhere Abscess formation with free rupture or with development of an internal or external fistula is a frequent sequel The clinical picture may be identical to that of appendicitis An important diagnostic help is the frequent association of *hematochezia It is a well known axiom that the symptoms and signs of acute appendicitis should suggest Meckel s diverticulitis when they are associated with intestinal bleeding in a patient under 30 years of age* It is to be noted that Meckel s diverticulum has its own artery and vein therefore when there is diverticulitis the inflammation extends to whatever structure the diverticulum or its cord is attached In the unusual case in which an acutely inflamed Meckel s diverticulum is attached to the umbilicus examination of the abdomen may reveal a periumbilical area of acute cellulitis (De Nicola s sign)

Obstruction of the ileum may be produced through several mechanisms Acute diverticulitis with its edema and abscess formation may by itself compress the bowel Later peritoneal response to the acute inflammation and perhaps to local rupture may cause obstruction More often the diverticulum is responsible for initiation of intussusception (Fig 103) It may turn inside out and act like a large intraluminal polyp for this but does not necessarily do so If the end of the diverticulum is attached somewhere by a cord the mechanical stage is well set for simple angulation of the ileum for initiation of volvulus about this axis and for development of an internal hernia Finally Meckel s diverticulum sometimes becomes incarcerated



FIG 103 Operative findings in case of ileo-ileal intussusception in young woman initiated by Meckel s diverticulum

within a hernia Femoral inguinal and ventral hernias appear especially likely to catch a diverticulum A hernia which contains a Meckel s diverticulum is known as a Littre s hernia

Lithiasis is rare As a matter of incidental information it may be noted that calculi which develop in Meckel s diverticulum contain rather large amounts of zinc but only traces of other metals unlike gallstones The calculi are often radiopaque but there is no information on just how often

Foreign bodies may rarely become incarcerated here It is usually a long pointed foreign body such as a toothpick or needle which causes trouble

Chronic specific infections and *primary tu*

is found and then it is likely to be a mucosal polyp About half of all intussusceptions occur in infants and at least 75 per cent in children less than two years old The 5 or 10 per cent which are encountered in adults are almost all due to a discrete intrinsic bowel lesion usually an intraluminal tumor The process starts when peristalsis begins to drag the tumor along through the bowel causing invagination of a sleeve of bowel wall The process is progressive to a surprising extent and perforation may also occur (Fig 105)

Meanwhile the patient experiences the sudden onset of abdominal pain with vomiting In the case of a baby it is characteristic for him to indicate that he wishes to be left strictly alone quite unlike the baby with simple colic who tries to snuggle to his mother Shock may quickly develop Bloody stools indicate that the intussusceptum has become ulcerated An enlarging tumor may be demonstrable by palpation In the ileocecal



Fig 104 Meconium ileus The finely bubbled appearance of the bowel contents permits the diagnosis

in some cases occasionally involving many feet of intestine About two thirds are ileocecal or ileocolic The obstruction results from changes within the internal loop or intussusceptum Actual mechanical blockage is not necessarily produced by the anatomic rearrangement The blood supply to and from the intussusceptum is compromised as it telescopes With ischemia ulceration gangrene

type emptiness can often be recognized while palpating the right lower abdominal quadrant due to taking up of the cecum into the advancing invagination (Dance's sign) Fever and leukocytosis indicate gangrene Although in infants and children reduction can sometimes be induced by the careful administration of a barium enema under fluoroscopic control one can place full reliance only on

in life when they may suddenly become responsible for small bowel obstruction Two membranes among many possibilities act this way with a little frequency Mayo s membrane runs from the inferior surface of the transverse colon to the right side of the first jejunal loop Lane s band joins the antimesenteric border of the ileum with the right iliac fossa They may cause fixation kinking and angulation of the intestine

Abnormal rotations of the small bowel hardly ever cause clinical troubles as common as they are Occasionally a segment of small intestine becomes trapped in the right upper abdominal quadrant by the mesentery of the cecum as the cecum rotates In cases of recurrent obstruction the diagnosis may be suspected when roentgenologic examination shows that the third portion of the duodenum is not present as such in the usual position This is the internal hernia of Waldeyer

Gallstone ileus accounts for about 3 per cent of jejunal and ileal obstructions and it is said that about 0 3 per cent of people with gallstones develop gallstone ileus Approximately 80 per cent of the patients are women and most are more than 60 years old at the time It is the gallbladder which contains a large solitary stone which is responsible The stone reaches the bowel lumen in almost all cases via a cholecystoenteric fistula following adherence of the diseased gallbladder to the proximal jejunum Rarely the fistula empties into the antrum of the stomach The fistula closes spontaneously and apparently quickly after the gallbladder has emptied its stone into the bowel The stone lodges in the terminal ileum in about 85 per cent of cases Clinically the obstruction is often intermittent or incomplete for a variable period prior to complete obturation The mortality rate is about 50 per cent rendering gallstone ileus one of the most dangerous types of small bowel obstruction

Meconium ileus is ordinarily encountered in neonates who have congenital cystic fibrosis of the pancreas It is believed that the diseased pancreas is simply inefficient in carrying out its normal function of partially liquefying the meconium Suspicion of meconium ileus arises when a neonate who has a patent anal canal and perhaps meconium in his rectum fails to move his bowels and becomes distended a day or two after birth In about half the cases a plain x ray film of the abdomen provides a specific diagnostic sign that of tiny scattered gas bubbles distributed through the inspissated meconium (Fig 104) Spontaneous rupture of the bowel with the production of meconium peritonitis is rare It can however occur even prior to birth This is an aseptic chemical peritonitis which if there is survival quickly stimulates peritoneal calcification

Volvulus is mentioned frequently elsewhere under the common inciting causes but a few general remarks are cogent here Volvulus occurs at all ages and it must not be overlooked as an important cause of acute abdominal emergencies in infants The reason that a loop of small intestine twists upon itself is a complex mechanical one It appears to be dependent partly on the normal dynamic activities of the bowel and there does not need to be any intrinsic or extrinsic disease for it to occur Usually however there is either a local mass on the loop which revolves or a restriction or fixation at the base of the loop Once a twist occurs it may spontaneously untwist or it may revolve several times An acute catastrophic situation is then produced In addition to obstruction of the bowel the arteries and veins of the involved segment become occluded or partly so In some cases signs of strangulation appear almost from the start In others a few days may pass before the severity of the injury becomes manifest By the time x ray examination shows fluid levels in the small intestine it is late Volvulus is of course an acute surgical emergency ordinarily requiring resection of the affected portion because of nonviability At least a 20 minute period of observation of the bowel after it has been untwisted is necessary before it can be judged to be viable

Intussusception in children is almost always primary i e independent of any intrinsic intestinal lesion which could be responsible for invagination In perhaps 5 per cent of infants and children such a lesion

be pushed far upward causing interference with respiration There is little pain from the bowel in contrast to mechanical obstruction and if the cause of ileus is other than peritonitis there may be no abdominal discomfort at all Instead of complaining the patient is often strangely euphoric The bowel is silent upon auscultation It is very common

clinical illness The obstruction itself is only a manifestation or complication It must be detected identified and treated but it takes only temporary precedence over the basic underlying disease

The over all mortality rate among patients with small intestinal obstruction today is approximately 12 per cent This bald figure



Fig 106 Paralytic ileus the day following cholecystectomy Most of the distended bowel here appears to be small intestine

to observe diarrhea during the early stages and it sometimes is almost continuous

CLINICAL MANIFESTATIONS AND DIAGNOSIS

When dealing with small intestinal obstruction one is necessarily concerned with a great many diseases and a great many degrees of

which cannot be applied clinically without delimiting modification is mentioned to emphasize that small bowel obstruction is more dangerous than colon obstruction The difference is that in the former gangrene develops proximal to the point of obstruction much more quickly Gangrene leading to

surgical reduction The mortality rate for intussusception in children is now about 15 per cent and it can be fairly said that it could be eliminated by early operation After simple surgical reduction the recurrence rate for primary intussusception in children is only about 2 per cent therefore a prophylactic surgical procedure to discourage recurrence is added to simple manipulative reduction only if an inciting lesion is found For adult patients segmental bowel resection is almost always *necessary* in order to eliminate the cause and preclude recurrence



Fig 105 Section from gangrenous intussusceptum of jejunal intussusception removed surgically There is severe ischemic necrosis and acute inflammatory infiltration

Paralytic (adynamic) ileus is a common condition Some degree follows all abdominal surgery due apparently to splanchnic irritation Surgeons have demonstrated time after time that rough handling of the bowel encourages postoperative atony Most types of acute systemic intoxication such as uremia and the acute infectious diseases may be accompanied by paralytic ileus In all these situations bowel dynamics return spontaneously often after only a few hours or a day or so even thou h the basic infection or intoxication persists More serious and *prolonged paralytic ileus* is that which accompanies acute peritonitis and occasionally certain severe central nervous system diseases such as acute encephalitis The entire intestine ordinarily becomes atonic and dilated (Fig 106) It is filled with gas and later fluid and the distention which may quickly become severe produces remarkable thinning of the intestinal wall A plain x ray film of the abdomen shows that the distended bowel segments have become arranged transversely across the abdomen producing the classic ladder pattern The diaphragms may

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peritonitis and spreading infection is the great threat in obstruction A general rule is that because of the rapidity with which fluid and electrolyte imbalances develop the higher an obstruction is the more serious the clinical problem it creates Many factors must be equal before such a rule becomes applicable of course and for practical clinical consider ation the nature of the process which is caus ing the obstruction is the factor primarily governing prognosis

There are several questions to be answered in considering diagnosis First the mere fact that obstruction exists must be recognized Then the level at which the obstruction lies and its nature or cause must if it is at all possible be estimated A more definite answer can usually be supplied for the further ques tions of whether the obstruction is complete or incomplete and whether it has developed acutely or gradually Most pressing of all is the need to recognize the presence of strangu *lation if it has occurred Strangulation* can be defined as any state of devitalization which results from impairment of the blood supply at or just orad to the area of obstruction

The main initial clinical manifestations of obstruction are vomiting abdominal disten tion and obstipation Cramping pain can be added for cases of mechanical obstruction Unfortunately for diagnosis the onset of symptoms may lag a considerable period be hind development of the obstructing process Even in the case of acute mechanical obstruc tion the patient often does not feel or appear particularly ill for a few hours There are cramps in the midportion of the abdomen and perhaps nausea but abdominal palpation may be normal and the pulse rate respiratory *rate temperature* blood pressure and leuko cyte count show no abnormality The first sign to be found in the abdomen is hyper peristalsis with a change in the bowel sounds towards increased frequency and higher pitch With great regularity it is found that pain and peristaltic sounds are simultaneous and this is considered to be a sign of importance In cases of jejunal and high ileal obstruction the pains and sounds come at intervals of 3 to 5 minutes while in low ileal obstruction the interval is about 10 minutes Gas distention usually develops soon long before tenderness can be detected After a period of cramps the duration of which depends largely on how far along the bowel the obstruction has occurred vomiting begins Patients with large bowel obstruction do not vomit until late in the course if at all In high complete ob struction the patient may pass flatus and feces for the first hour or so but ordinarily one can expect to find obstipation It is often difficult to feel any mass through the dis tended abdominal wall but sometimes one can be reached upon rectal or pelvic examina tion

Progression to very serious illness becomes evident when distention of the orad segment of intestine has developed to the point of inducing venous obstruction mural hypoxia and gangrene (Fig 107) This is strangula tion Local peritonitis or free perforation must eventually supervene if acute obstruction is *neglected Strangulation is most often* a com plication of obstructions which are caused by incarceration of the bowel in external hernias It is likely to follow processes which develop suddenly The pain becomes parietal and localized to the area of gangrene Often it is referred to the back Precise tenderness appears and there is the abdominal muscle spasm of peritoneal irritation Peristaltic sounds die away Distention may produce marked diaphragmatic elevation There may be small amounts of bloody discharge from the rectum Fever and leukocytosis develop Shock super venes at any point It has *frequently been* noted that the shock shows almost no re sponse to intravenous administration of fluids Diagnosis of strangulation can be confirmed by drawing a small amount of fluid from the peritoneal cavity through a small needle it will not be bloody unless there is strangula tion The need for this examination however rarely arises

The metabolic problems begin early and become compounded as time goes on Loss of water and electrolytes into the bowel lumen is of remarkably large amounts and *this contributes to the development of shock* The clinical effects are felt earlier in high

obstruction than in low because of associated vomiting In low obstructions vomiting may come so late and be of such mild degree that the body s chemistry is not greatly influenced On the other hand during periods of heavy vomiting the volume of fluid secreted by the



FIG 107 Final phase of small bowel obstruction There has been gangrene and perforation just above the obstruction and now there is generalized purulent peritonitis

stomach is tremendously increased and calculations of the body s losses must be made with this in mind In cases of high jejunal obstruction 30 times as much secretion as normally produced may become available to the stomach for expulsion In addition to dehydration and hemoconcentration there may be important hypochloremia hypokalemia alkalosis and azotemia Because gastric secretion gradually becomes depressed in the face of increasing azotemia it is well to remember that the rapidity of chloride loss usually decreases as the condition worsens Hypokalemia can greatly aggravate ileus and in fact it can also cause adynamic ileus of itself

When obstruction is chronic and incomplete as in a Richter s hernia the entire clinical problem is quite different The hyperperistalsis phase persists and is effective in its propulsion Diarrhea is the rule instead of vomiting Peristalsis may be visible upon the abdominal wall Ordinarily there is no dis

tention or danger of gangrene but whatever the cause the danger of progression to acute complete obstruction is a constant threat

Detection of mechanical obstruction is a clinical matter and is ordinarily no problem Determination of the cause and level of ob

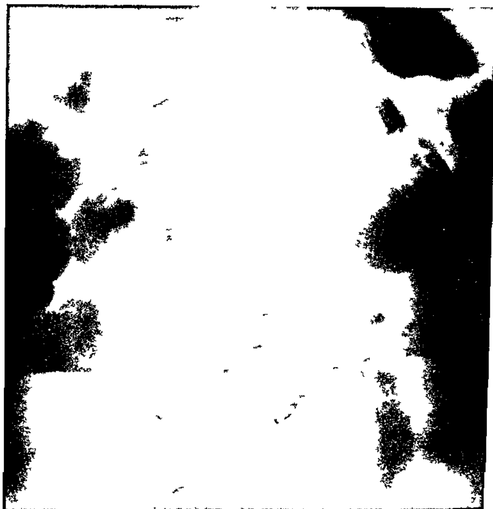


FIG 108 Early dynamic phase of obstruction due to postoperative adhesions All of the distended bowel is identified as small intestine Supine film

struction is quite another problem and often must wait for surgical exploration A plain x ray film of the abdomen usually permits rough estimation of the level of obstruction if the distended bowel segments can be identified (Fig 108) Roentgen signs make their appearance within three or four hours of complete obstruction The first sign of volvulus is often the C loop sign indicating gaseous dilatation of a segment of bowel Ordinarily more generalized dilatation follows rather quickly Contrast fluoroscopy with the help of a nonparticulate liquid contrast medium is not contraindicated but is not used much because it rarely gives helpful information

TREATMENT

There are three major aims in treating mechanical small bowel obstruction decompression of the bowel restoration of fluid and electrolyte balances and elimination of the obstruction Depending on the nature of the disease which has led to the complication there may of course be several other therapeutic matters to resolve especially anemia and infection The majority of pa

tients in fact are found to require blood transfusions and antibacterial coverage Although therapy is ordinarily directed toward surgical relief of the obstruction as soon as the patient can be properly prepared in an occasional instance of adhesive obstruction it is found that the obstruction spon

is indicated based primarily on bowel decompression by aspiration This is an atonic bowel with very little or no propulsive activity to drive a Miller Abbott tube along and ordinarily little more than proximal decompression is accomplished until the bowel regains its function It should be recalled



FIG 109 Patient shown in Figure 108 now filmed in the upright position The fluid levels are well demonstrated

taneously is reduced as the bowel is decompressed Whenever evidences of strangulation appear emergency laparotomy must be done without delay In any case individualization of each problem is an important principle of therapy

For adynamic ileus which is not due to spreading peritonitis medical therapy alone

in dealing with cases of postoperative ileus that in spite of popular belief morphine is a good drug for prevention of atonic ileus and for assisting with care of the atonic bowel In desperate cases it is often possible to initiate bowel peristalsis by inducing spinal anesthesia

Twelve hours of small intestinal aspiration

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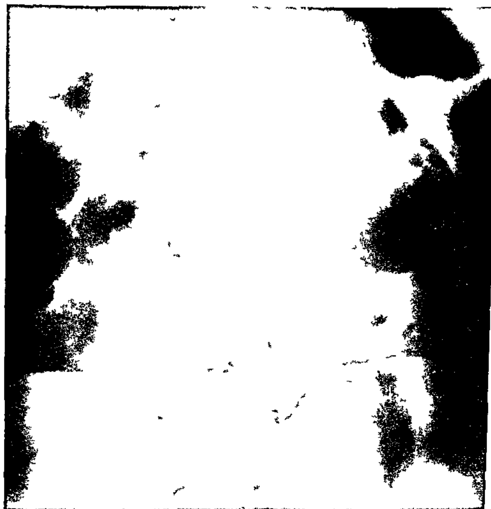


FIG 108 Early dynamic phase of obstruction due to postoperative adhesions All of the distended bowel is identified as small intestine Supine film

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ance is that of an irregular cobblestoning (Fig 110) Most of the cysts are sessile although there may be large pedunculated clusters of them protruding out into the peritoneal cavity In the rare instances in which the cysts are confined to the submucosa external appearances may be normal although the disease may be detected by palpation

The individual cysts vary from submacroscopic size to a diameter of several centimeters Most measure from one half to one centimeter They are thin walled without demonstrable intercommunications The wall is made up of intact endothelium closely surrounded by a small amount of inflammatory reaction The lesions are sterile The contained gas is odorless and under pressure Its composition approximates that of expired air in some cases In others a very low oxygen pressure has been recorded At times it is found that the mesenteric lymph nodes are enlarged and it is said that their histopathologic appearance may be superficially similar to that observed in Whipple s disease

This appears to be a mechanical pneumatosis—a passive tissue aerophagia—produced by the forcing of gastric or intestinal gas into and along the mural lymphatic vessels where it becomes trapped Presumably the portal of entrance is the ulcer or other primary gastrointestinal lesion which precedes cyst formation Although secondary infection sometimes occurs there is nothing to suggest that gas forming organisms are responsible for the cysts

Pneumatosis cystoides is ordinarily a very benign process and the great majority of cases have been discovered only by chance during study for the primary disease This makes one suppose that it may sometimes pass unsuspected It is known that in some cases the cysts persist over a long period In other cases quick development and spontaneous clearing within a few weeks have been observed The symptoms are simply those of the primary disease Distention abdominal pains and diarrhea have been ascribed to the cystic process Examination of the abdomen usually gives no indication of the pneumatosis when there is no complication although apparently in some instances it is possible to palpate segments of the thickened bowel



Fig 110 Pneumatosis cystoides intestinalis as observed at laparotomy during exploration of the cecum

By far the most common complication

is warranted and desirable before operation *in all* cases of small intestinal obstruction when there is no sign of strangulation Suction has no place on the other hand in treatment of colon obstruction The atonic bowel of late small intestinal obstruction often thwarts all nonoperative efforts at decompression After 12 hours of intestinal aspiration the clinical and roentgenologic changes which have transpired should be carefully revaluated before the decision is made to continue In most cases one should get on with surgery as soon as decompression has been achieved

Decompression of the small intestine by aspiration through the travelling Miller Abbott tube is a well known technic which requires no detailed comment In passing the tube use of a flexible stylet is helpful for assuring that the tip enters the duodenum without delay The harassing problem presented by a coiled Miller Abbott tube in the stomach of a patient who is in need of decompression is familiar to any gastroenterologist who has ever been an interne Air must never be added to the mercury balloon because the mercury will plug the channel making it impossible to withdraw the air It is important that once a Miller Abbott tube starts down the bowel it keep moving If it rests long against the area of obstruction it is capable of producing pressure necrosis

The matter of caring for fluid and electrolyte requirements offers no unique problems in this situation The needs are more easily judged than they are in many clinical situations Judged is used rather than measured because the clinician s responsibility is not to see to it that the laboratory reports show the level of each circulating electrolyte to fall within the normal range but rather to assure that the patient as judged clinically is supplied with enough *but not* too much of everything he needs Clinicians are still necessary Not much solace is to be had from the fact *that the* patient *died* in laboratory electrolyte balance

PNEUMATOSIS CYSTOIDES INTESTINALIS

This disease has proved particularly fascinating to all who have encountered it It differs in many respects from all other abdominal processes and must be thought of in a category by itself however it probably represents a complication of certain common gastrointestinal diseases or at least is almost always associated with some other demonstrable gastrointestinal lesion A disease with identical morphologic features is well known in hogs and has been discovered in some other animals

The sex incidence is the same as it is for duodenal ulcer men predominate in a ratio of 3 5 1 Most diagnoses are made when the patients are in the third fourth or fifth decade of life Primary disease of the gastrointestinal mucosa is demonstrable in about 85 per cent of cases This most commonly is benign ulcer of the gastric antrum Duodenal ulcer, pyloric ulcer gastric carcinoma regional enteritis acute appendicitis and many other associated diseases have been reported It is probably not proper to consider the remaining cases as primary because so often small localized lesions such as acute and chronic ulcer cannot be demonstrated by the usual examination technics

The process grossly is characterized by the presence of multiple gas filled cysts in the wall of portions of the intestinal tract and occasionally in peritoneal adhesions mesentery omentum and parietal peritoneum The small bowel or segments of it are most often involved especially when the primary disease lies in the region of the pylorus In other patients the ileocecal junctional area is often the major site of cyst formation Rather often scattered segments are affected and the process may follow down as far as the rectum In all these areas great numbers of cysts form often being separated from one another only by thin tissue septa Most of the cysts lie in the subserosa The submucosa and muscularis mucosae often escape entirely The external serosal appear

the exanthem Approximately 70 per cent of the patients are males They most often first get sick during the second or third decade of life although apparently no age may escape

An acute infection such as streptococcal pharyngitis acute rheumatic fever or acute glomerulonephritis often is the initial although not necessarily the causal phase The actual etiology appears to be food allergy in a portion of the patients and streptococcal hypersensitivity in the others The common clinical characteristics are abdominal pains cutaneous purpura joint pains splenomegaly urine casts hematuria and albuminuria Recurrence is as typical as any of the disease s features The abdominal symptoms are due to subserous and mucosal purpura of parts of the small intestine sometimes the stomach and the parietal peritoneum It is the distal ileum which is most commonly affected but isolated segments of any part of the jejunum or ileum may be involved Illness may develop quickly presenting as an acute abdominal emergency Severe colicky pain is characteristic There may be radiation in several directions including up into the chest and down into the thighs Nausea and vomiting often accompany the cramps Hematemesis and gross hematochezia are not rare The purpura is most often distributed over the extensor surfaces of the extremities and the buttocks There may be dermatographia or cutaneous angioneurotic edema The Rumpel Leede phenomenon is present this parenthetically is a valuable test in any case of colicky abdominal pain There is fever and this may last many days Ascites is common often developing and clearing quickly It may be bloody or appear like a simple transudate Abdominal tenderness is regularly encountered and is associated with distention and spasm Usually there is leukocytosis during the acute episodes but there is no significant eosinophilia Attacks last a few weeks or even months Illnesses persisting as long as four years have been described As the picture develops the clinician often finds himself unprepared for its seriousness for the mortality rate amounts to about 15 per cent

It is remarkable that such simple pathology may be responsible for such variable and often seemingly catastrophic abdominal symptoms There are typical cases without complications forms in which peritoneal purpura simulates such conditions as acute peritonitis with paralytic ileus and cases which are complicated by small intestinal obstruction intussusception and perforation Severe hemorrhage occasionally occurs It must be emphasized that a significant proportion of all instances are actually mild clinical illnesses amounting perhaps only to simple colic and vomiting which never suggest the necessity for surgery In about one third of the cases abdominal symptoms precede the appearance of cutaneous purpura presenting special diagnostic difficulties One in ten patients has a palpable abdominal tumor explained by massive bleeding into a segment of the bowel Small bowel obstruction may develop as a result of intussusception occlusion due to intramural hemorrhage paralytic ileus resulting from hemorrhage or late cicatricial stenosis which follows healing of hematomas Intussusception is usually ileocecal Gangrene with perforation is rare

The pathology within the small bowel is characterized by its ephemeral changes If the abdomen should be opened at the peak of an attack an intestinal segment is found to be tremendously thickened congested and hemorrhagic The appearance may simulate that of regional enteritis closely If the bowel is opened its mucosa is found to be edematous inflamed and ulcerated In spite of the fierceness of the changes a second operation only two weeks later may show that the bowel has returned to gross normalcy

It is generally true that patients with Henoch s purpura withstand surgery poorly nevertheless laparotomy must often be carried out either because the best clinical opinion even though wrong demands it or because it is apparent that intussusception has occurred It is a hearty surgeon who

is simple benign pneumoperitoneum This seems to prove that the subserosal cysts may rupture spontaneously In view of the very large amounts of free gas which sometimes form it also seems to prove that gas can be continuously pumped from the intestinal lumen through the lymphatic channels Intestinal adhesions often form and these too sometimes develop gas cysts There are several mechanisms through which intestinal obstruction may develop including constriction by adhesions intussusception extrinsic compression volvulus and simple obturation by large submucosal cysts

Diagnosis is often possible by roentgenologic study Plain films of the abdomen may permit dectection of gas bubbles on the bowel profiles If pneumoperitoneum is present identification is made easier With the help of a barium meal or barium enema rounded defects may be detectable in the intestinal lumen Sometimes a bizarre picture of gross deformity is obtained If the disease involves the distal sigmoid or rectum the sigmoidoscopic appearance may be that of multiple polyposis but the situation is clarified by a biopsy specimen

Active treatment is not indicated unless there has been bowel obstruction This is usually a benign and subclinical process and probably it is self limited in most cases Nothing is accomplished by bowel resection if there has been no complication and development at other sites can be expected in a portion of cases even if all diseased areas are extirpated Development of pneumatosis on the other hand should cause one to focus more critically on the primary gastrointestinal lesion and perhaps encourage more radical treatment of this

PRIMARY ULCER OF SMALL INTESTINE

It is not possible to know how frequently primary Cruveilhier type ulcers occur in the small intestine Judging from autopsy observations they are rare but because they tend to be rather acute lesions it is possible that they develop more frequently than is appreciated only to heal quickly again These are discrete single lesions which involve the jejunum more often than the ileum Pathologically they show the features of acute ulcers of the stomach It is believed that they ordinarily remain silent unless there is a complication and their reputation for complication may therefore actually be unjustified Sudden perforation and severe or occult bleeding are usually the first manifestations Diagnosis is very difficult Rarely can ulcers in this location be demonstrated roentgenologically

HENOCH S PURPURA

Henoch s purpura is the visceral form of anaphylactoid or capillary purpura As with all allergies the degree to which individual reactive patterns among the anaphylactoid purpuras differ is so striking that their categorization is very difficult The important manifestations are a specific exanthem any one or more of a variety of gastrointestinal symptoms transient arthralgia and a tendency towards recurrence Both in the literature and in one s own practice one must recognize much valid interpretational leeway as to whether or not the label of Henoch s purpura may be applied The anaphylactoid purpuras so frequently produce manifestations in both the joints and the alimentary tract that most cases can reasonably be considered Schonlein Henoch purpura The present discussion which must be confined by rather artificial limits is included in the chapter on the small intestine because to the gastroenterologist this organ shows the most overt reaction

This is a disease affecting capillary integrity and its manifestations therefore are widespread The circulating thrombocytes are not involved ordinarily but as though to confuse the matter further allergic reactions may occasionally cause thrombocytopenia Unfortunately a depressed platelet count does not exclude the diagnosis of Henoch s purpura Furthermore purpura is neither uniformly present clinically nor is it the essential histopathologic feature of

tion may reveal an acutely ill frightened patient or merely a person with new pain in his abdomen Auscultation shows hyperperistalsis There may be a little distention Abdominal tenderness is unusual

Although in some cases the only manifestation is pain and this persists for several days without variation usually within a few hours changes in both the subjective and objective manifestations warn that disaster is approaching The three important signs of impending gangrene are the development of fever

In all cases treatment requires resection of the injured bowel Never can one hope that spontaneous recovery might occur in a patient who has suffered sufficient bowel injury to permit clinical detection of the process The risk of treatment is often very great for the basic disease may be subacute bacterial endocarditis or abdominal aortic aneurysm with renal artery involvement Occasionally a very long segment of nonviable bowel must be removed and in rare instances subtotal viscerectomy is necessary



Fig 111 Surface appearance of colon in fatal case of pseudomembranous enterocolitis

leukocytosis and shock The pain moves from the midline to the location of the involved bowel Although disappearance of pain is frequently synchronous with the onset of gangrene this can be a misleading point Diarrhea slows or stops Ileus develops A palpable mass sometimes appears but this is an unpredictable sign and a variable degree of involuntary abdominal spasm may render satisfactory palpation impossible The abdomen becomes quiet to auscultation

There are no roentgenologic or laboratory studies which are helpful in proving the diagnosis They may help by excluding some of the many disease possibilities which almost always must be considered—myocardial infarction acute pancreatitis acute perforation of the bowel intussusception etc

PSEUDOMEMBRANOUS ENTEROCOLITIS

This is an acute necrotizing process affecting the mucosa of the small intestine and colon either in entirety or segmentally with skip areas A wide variety of medical and surgical diseases may immediately precede it but in most cases it seems to behave as a complication of gastrointestinal surgery Commonly a few days before onset the patient most often a woman has been operated upon for carcinoma of the colon or for carcinoma of the stomach This is then a disease encountered to a large extent only among patients who are already hospitalized

The pathology of the disease which is sometimes known as acute necrotizing en

can resist exploring the patient who manifests his illness by signs of acute abdominal mishap even though cutaneous purpura be present Operative mortality as recorded in the literature of the past 50 years has been very high—from 30 to 60 per cent even without incision into the bowel—but the disease is uncommon enough so that there are not yet sufficient data to permit judgment of the risk under modern operative conditions Time cures at least temporarily some or perhaps most uncomplicated cases Antihistaminics are useful in some instances but their effects are unpredictable Cortisone helps some patients over the acute episodes and in a few its effects are miraculous but full evaluation has not yet been made

MESENTERIC VASCULAR OCCLUSION

It has *become customary to divide cases* of mesenteric vascular occlusion into those due to arterial disease and those due to venous disease This is useful for etiologic thinking but for clinical and pathologic purposes it must be remembered that often both blood inflow and outflow become obstructed one secondary to the other

Mesenteric vein thrombosis is usually sec*ondary to local infection somewhere among* the abdominal organs in a portion drained by the portal system There is commonly pylephlebitis of the main portal trunks in addition to inflammation of the more distal veins Once septic thrombosis begins it may extend widely It should be noted however that the mere presence of venous stasis secondary to hypertension does not encourage *spontaneous thrombosis of the mesenteric* veins or their branches mesenteric vein thrombosis is no more common among patients with chronic portal vein occlusion or cirrhosis than among other people Occasionally mesenteric vein thrombosis follows abdominal operations in the absence of venous injury or infection Other infrequent causes are polycythemia vera thromboangiitis *obliterans* penetrating trauma of the vein and external compression of the vein

Mesenteric artery occlusion is likewise usually due to thrombosis Ordinarily sclerotic changes have occurred in the artery Less often occlusion is due to embolism from the mitral valve or left atrium The whole celiac axis may become blocked when a dissecting aortic aneurysm passes through the area or when an ordinary sclerotic aneurysm involves the region of the axis It is reported that periarteritis nodosa may occasionally cause mesenteric occlusion

The pathologic changes of course are those which lead in the direction of gangrene and necrosis of the affected part of the bowel The exact anatomy of the obstructing vascular lesion in relation to the arterioarterial and venovenous intercommunications governs to a large extent the degree and rapidity of mural damage Out in the mesentery the anatomy of the vasculature par*ticularly that of the arterial arcades* is such that a great degree of protection is provided against ischemia Even though a major vessel is occluded there may be enough collateral circulation to maintain vitality or any degree of decompensated ischemia may develop Ordinarily secondary evidences of bowel obstruction are rather minimal and the intestine proximal to the damaged seg*ment does not often dilate or show* other overt signs of indirect injury

The disease may affect any age and either sex but most patients are men in midadult life Clinical diagnosis is often very difficult and unless the etiologic circumstance be suspected it is usually not possible to distinguish arterial from venous occlusion The onset of symptoms is often acute Severe *pain of a gnawing remitting* nature comes first It begins in the midabdomen with the characteristics of visceral pain and is explained by the spasm of anoxia Nausea and vomiting usually follow soon In some patients with sudden extensive arterial occlusion shock develops quickly In other cases it is a relatively late manifestation Diarrhea may appear soon after the pain and often the stools contain gross blood especially when the mechanism is venous occlusion During this initial phase physical examina

is marked by sudden irreversible shock Nausea vomiting and diarrhea are usual features At times the stools contain gross blood but serious bleeding is not encountered Passage of membranous shreds in the stool probably always occurs and is most helpful in diagnosis Only a little effort is required to look for and identify them There is severe loss of fluids and electrolytes and tissue dehydration seems to persist in spite of vigorous fluid replacement Oliguria is one result and in addition there is usually at least moderate renal injury Early the urine contains albumin casts red blood cells and white blood cells If the patient survives a period of uremia may be expected Proof of bacteremia can sometimes be obtained Varying degrees of liver damage have also been encountered and after a few days jaundice may appear Transient neurologic manifestations which seem to be an indication of metabolic toxicity are common

Clinical shock is the most dangerous sign Recovery is possible but not usual after shock appears Sometimes the patient quickly goes into shock at the outset and dies in a few hours The shock is peculiarly resistant to the usual efforts to induce normotension

Treatment is directed at emergency rehydration and electrolyte replacement This often must be done rather blindly because of the need for haste and the specific electrolyte needs are judged from clinical evaluation Because it appears that surface bacterial infection adds to the seriousness of the process it is advisable to begin Erythromycin therapy immediately before bacteriologic study of the stools has been completed For shock nor-epinephrine should be tried but often it will be found wanting Use of intravenous hydrocortisone has been reported as providing good support over the acute period of mucosal slough One would ordinarily like to withhold all antimicrobial agents except Erythromycin and the surface infectious process might be worsened by steroid hormone therapy This is a theoretical objection and hydrocortisone therapy limited to a few days might help more than harm The possibility of bowel perforation during steroid hormone therapy is a hazard which cannot at the moment be evaluated

THE SALMONELLOSES

TYPHOID FEVER

It seems strange that in the planning of a book on gastroenterology in this era it can be decided that typhoid fever deserves only a little more space than pneumatosis cystoides intestinalis Typhoid fever is still important enough but in this country at this time the hang over of typhoid teaching in medical schools and standard texts from a former year exceeds that warranted by its present incidence Unless one is actively engaged in public health work typhoid fever can in relative terms be looked upon as an uncommon disease

The typhoid fever organism which parasitizes only man is now generally considered properly to belong among the Salmonellas It is known as *Salmonella typhi* typhi having precedence over typhosa It is a motile gram negative organism which produces no gas Final identification depends on its agglutination reaction to specific serum The organism has two constant antigens the heat labile H (flagellar) and heat stable O (somatic) In some particularly virulent strains there is a surface antigen which is labeled Vi

Typhoid fever is an infection which seeks out largely the lymphoid tissue of the body When the organism is ingested with contaminated food or drink it probably enters the tissues via the lymphoid patches of the small bowel the mesenteric lymph nodes and the thoracic duct Then as a hematogenous infection it tends to settle particularly in the spleen lymph nodes marrow liver biliary tract lungs and of course small bowel itself Lymphoid hyperplasia is the basic pathologic response and it is particularly striking in the spleen mesenteric nodes and Peyer s patches of the ileum In the latter site local necrosis is not uncommon

teritis is characterized by sudden devitalization of large areas of mucosa (Fig 111) There is necrosis and exfoliation of the superficial mucosal layers with edema and hemorrhage beneath The mucosal capillaries and venules show stasis and the submucosal vessels frequently contain hyaline thrombi There is a great torrent of fluid from the congested eroded surface Some of this clots forming a loose pseudomembrane The membrane *is composed of fibrin* leukocytes mucus epithelial cells bacteria and debris (Fig 112) Healing progresses simply by sequestration of the membrane and epithelial regeneration



Fig 112 Section of colon in fatal case of pseudomembranous enterocolitis showing acute necrosis of mucosa underlying edema and typical membrane

Etiology is not at all clear but it seems certain that too much blame has been placed on the antimicrobial drugs Pseudomembranous enterocolitis was recognized before bacteria were and there is no evidence to suggest that the disease is becoming more common It may well be that in their upsetting of the enteric flora these drugs permit certain resistant virulent organisms particularly strains of hemolytic staphylococci to *add to the surface damage* but the basic cause must be one which depresses intrinsic mucosal vitality Presumably this must be *a hypoxic process The sudden* and simultaneous devitalization of many feet of the mucosal tube with sparing of the deeper tissues *suggests a local vascular fault Fur*ther than this one cannot go but the bowel s *arteriovenous shunt* mechanism offers an attractive explanation

The clinical picture is often a frightening thing and those who have had experience with cholera say that it is reminiscent of that disease Many of the features are accounted for by sudden hypovolemia The patient usually is in the immediate postoperative period or he may have any one of a number of illnesses at the time The manifestations of severe illness develop *in the course of* an hour or so beginning with abdominal cramps and fever Occasionally the onset

portant An O titer of 1 160 is usually considered the borderline for diagnosing active infection In vaccinated persons a constant low titer is maintained and in an occasional one this may cause diagnostic confusion Although the H titer is more specific than the O titer it tends to rise during any acute febrile illness that the vaccinated person may experience

Chloramphenicol is a remarkably effective drug for treatment of typhoid fever In order to preclude relapse it should be given for about 20 days although most patients will appear well recovered long before this For the first five days a daily dose of 3 gm is advisable and thereafter 1 5 gm daily is proper There is something to be gained for the desperately ill patient by adding cortisone for a few days at the start Chloramphenicol cannot be counted upon to eliminate the infection from the gallbladder of carriers Cholecystectomy is the proper treatment for this



FIG 113 Rose spots in patient with typhoid fever The trunk is the usual location for the exanthem

PARATYPHOID FEVER AND OTHER SALMONELLA INFECTIONS

The science of the Salmonellas is a dynamic one The organisms are classified according to their antigenic characteristics and specific identification is a complicated matter which is not often done except at certain bacteriologic centers The experts say that there are now about 230 serologic types and if this is not enough to confuse the clinician the organisms cause illnesses which show confounding variations and degrees of seriousness In addition to septicemia abscesses and a variety of other localized infections the salmonelloses include all sorts of acute enteric illnesses from mild gastroenteritis to severe enteric fever These are ubiquitous organisms affecting many animals and birds in addition to man and perhaps it is a wonder that human infection is uncommon

Infection is acquired largely by ingestion through contaminated food Dehydrated egg products and processed meats are believed to be the commonest sources Salmonella infections are common in newly hatched chicks and it is believed that the organism is commonly passed from the hen through her eggs Rodents are a minor source of infection but possibly domestic pets are not Flies are effective transports for the organisms Person to person contact spread

and the result may be severe hemorrhage or perforation of the bowel wall Infection persists in the blood stream during the first week or 10 days of infection permitting isolation by blood culture During the second week circulating antibodies appear and pre sumably for this reason the bacteria become localized to restricted sites in certain organs Throughout the acute phase bacteria are eliminated in the urine and feces although in the latter they appear initially in such small numbers that one cannot count on a positive stool culture until the second or third week of illness After active infection has ceased and the patient has recovered a carrier state persists in about 2 per cent of cases Almost always this commensal infection is maintained in the gallbladder but occasionally it is in the urinary tract

Clinically many degrees of severity are encountered The incubation period lasts from 5 to 12 days Development of illness is gradual over 3 or 4 days beginning with vague malaise extremity pains dizziness headache and fever Cough is common among children As illness becomes overt the fever becomes remittent and by the end of the first week it reaches high levels There is albuminuria Prostration often is severe and as the word typhoid suggests this after a while may give way to mental confusion and delirium In any case anorexia nausea vomiting constipation and epistaxis are com mon early manifestations Ordinarily diar rhea does not appear until several days have passed

Upon examination within a few days of onset it is characteristic to find relative brady cardia in association with the fever The pulse later becomes dicrotic The abdomen is distended resistant and often tympanitic A plain x ray film of the abdomen at this stage often shows dilation of the proximal small bowel with gas and the appearance may closely simulate that of small bowel obstruction Abdominal tenderness is pres ent but its degree varies considerably There is no leukocytosis Eosinophils disappear from the blood smear By the second week the tongue begins to peel The muscles feel soft and hypotonic Splenomegaly appears and almost always leukopenia accompanies it During the second and/or third weeks in almost all patients a slight rash develops In order to detect it however it is necessary to examine the skin daily and closely The typical lesion is the rose spot a rather bright red blanching circular macule 1 to 3 mm in diameter (Fig 113) Rose spots occur in small crops sometimes only three or four at a time Usually they are found over the lower anterior chest and upper abdomen

In the absence of treatment the course may be very long extending over a period of many weeks in some cases With more ef fective therapy the clinical outlook has im proved tremendously and at the moment the mortality rate is no more than 1 per cent Serious complications are of course less frequently encountered than they used to be but they still constitute a threat Bleeding from the ileum is common during the acute phase but serious hemorrhage is not Never theless some degree of anemia almost al ways develops during the early part of the course Perforation of the bowel is said to occur now in only about 2 per cent of the cases It is a catastrophic event because of the acute underlying illness the exten sive peritoneal soiling and the poor condi tion of the intestinal wall for surgical closure Severe myocarditis is a rare complication Acute typhoid pneumonia cholecystitis and periostitis represent excessive local reaction to hematogenous seeding They may not make their presence known clinically how ever until several weeks have passed

Because of decreasing familiarity with the disease clinical recognition can be expected to become more difficult Blood and stool cul tures are important for confirmation of clinical suspicion The former is rarely posi tive after the third week of illness and the latter cannot be expected to be positive until the second or third week The Widal test for H and O agglutinins is specific As with all serologic tests for acute infectious dis eases demonstration of a rising titer is im

among a group of people who have eaten approximately the same amounts of bad food some are severely prostrated while others escape with a cramp or two

Specific identification of the poison is of much more than academic importance Detailed investigation may eventually show for instance that a certain food handler has a staphylococcic infection on his hand Until this is discovered and he is relieved from his duties he will continue to inoculate food with a dangerous organism Often some tiresome detective work is necessary to track down the source of the guilty agent In most areas public health workers are quickly available to help with this The means of carrying out the investigation are well known —detailed individual histories are compared so that a common denominator may b found for identification of both the type and the source of the bad food and cultural and toxicologic investigation is carried out on vomitus and feces from many patients in order that the poison itself may be identified

SPECIFIC AGENTS

Acute *Salmonella food poisoning* or acute epidemic gastroenteritis may be the work of many species About one quarter of the outbreaks are due to *S typhimurium* The two other common species are *S oranienburg* and *S newport* As stated above the incubation period varies from 6 to 48 hours averaging 12 to 15 It is the longest displayed by the various food poisonings as one would suspect from the fact that the organism must become established and prosper to a certain extent before it can cause trouble The illness lasts from 2 to 5 days Its main manifestations are fever nausea vomiting abdominal pains diarrhea and headache Rarely there are convulsions and complicating pneumonia

The important *inorganic chemical agents* are the caustics arsenic lead cadmium and the fluorides Caustics are mentioned elsewhere Cadmium which is soluble in acid solutions has become less important as a toxic threat now that cadmium plating is no longer used on cooking and storage utensils Cadmium poisoning causes a quick brief and relatively benign illness manifested by nausea vomiting cramps and diarrhea Sodium fluoride a common ingredient of insecticides can cause severe illness and death within 6 to 12 hours when used by mistake in the preparation of food In addition to the signs of acute gastroenteritis there frequently are muscle cramps convulsions and variable paralyses Following recovery there may be residual kidney and liver damage

The *exotic foods* which may poison are many Mussels and less commonly clams acquire a potent neurotoxin when they subsist on certain plankton species The clinical manifestations which follow their ingestion are marked by paralysis and sometimes respiratory failure A great many mushroom species—perhaps 90—are poisonous for man The clinical manifestations are to some extent characteristic from species to species Some mushrooms contain a hemolysin and others a renal toxin Many produce salivation convulsions and delirium in addition to the less specific manifestations of nausea vomiting and cramps Poisonous fish which are responsible for the disease called ichthyosarcotoxism are found in all warm seas and frequently it is found that they can be recognized only by the native people The poison is a neurotoxin and death by respiratory paralysis occasionally occurs The usual special manifestations are pruritis myalgia paresthesias paralyses and convulsions

Bacterial toxins are by far the most important cause of toxic food poisoning Some such as those responsible for botulism a neurointoxication and those which may possibly be elaborated by certain coliform strains have been overemphasized Alpha hemolytic streptococci which require an incubation period of 3 to 12 hours and cause a relatively brief illness are a rare cause of food poisoning This leaves the staphylococci and the clostridia other than *Clostrid*

is probably uncommon The organisms are relatively resistant to the elements and unlike *Salmonella typhi* they are able to multiply outside the body Each species tends to produce its own kind of disease although there are many exceptions *S suipestifer* infection for instance characteristically is a septicemia

Paratyphoid fever is usually due to *S paratyphosa S schottmuelleri* or *S hirschfeldii* It is very much like typhoid fever except the illness is milder and briefer The onset is rather sudden and often diarrhea appears at the outset The rash tends to be more generalized with spots which are up to 5 mm in diameter Complications are rare Approximately 2 per cent of the patients develop acute appendicitis a complication which may be difficult to recognize because of occlusive obstruction by lymphoid hyperplasia Although the general pathologic changes are reminiscent of typhoid fever the hyperplastic lymphoid tissue of the small intestine seldom undergoes ulceration For treatment it is necessary to test the sensitivity of the responsible organism to the various antimicrobial drugs for different species and strains react quite differently to them

FOOD POISONING

The term food poisoning is an unfortunate one because it is used as a diagnosis in situations which demand specific etiologic labels It is especially important to think of the toxic forms quite separately from the infectious forms The only features that the many many types of food poisoning have in common are their ingestive etiology acute course and frequent epidemic circumstance

It is almost impossible to put a proper limitation on definition of the infectious forms for it might well be argued that they should include such diseases as cholera and typhoid fever in addition to the generally accepted form which is due to *Salmonella* infection Infectious food poisoning is the result of bacterial multiplication and activity within the body after inoculated food has been eaten It is a true infection The toxic types of food poisoning are illnesses due to organic or inorganic poisons which already exist in the food at the time it is eaten Very often the poison is a product of bacterial growth It is important to understand that the problem is not that of simple putrefaction or spoiling but of actual inoculation of the food with some specific toxin producing organism The prophylactic implication is obvious one cannot rely on the appearance or odor of food in judging whether it is safe to serve In many societies dietary items which depend on bacterial spoilage for their preparation are considered to be the special delicacies

An epidemic of food poisoning provides an exciting and valuable experience for the clinician His obligations are usually acutely demanding for many hours but there is time for contemplation of the several remarkable phenomena which are going on all about him Except for the rare poisons which depend on an allergic mechanism such as that contained in the fava bean there is no way to determine clinically what the precise poison may be Some hint may be obtainable immediately from the histories of the affected people and from estimation of the mean incubation period Thus chemical and most exotic food poisons cause illness immediately or within half an hour and streptococci and clostridia about 12 hours Salmonellas have an incubation period which varies from 6 to 48 hours with a peak at from 12 to 15 hours These are only general mean figures and as an epidemic progresses and patients continue to present themselves over a period of several hours it is often necessary to revise one s initial estimate of the type of causative agent The wide spread in incubation periods encountered in every epidemic is explained in part by differences in the amount of poison ingested and in part by differences in individual tolerance to the agent The varying degrees of sickness produced on the other hand seem to depend largely on the tolerance factor This is the most remarkable phenomenon of all It is common to observe that

by feeding them finely pulverized silica suggesting the possibility of simple mechanically induced granulomatous obstruction There is interesting speculation regarding the possible role of subclinical chronic pancreatic inflammation or retropancreatic fibrosis in producing the lymphatic blockage both because of the anatomic relation of the pancreas to the small bowel lymphatics and because at the autopsy of fatal cases some degree of pancreatic fibrosis can usually be found The problem here as so often is the case is that of distinguishing cause from effect A third approach which is active at the moment has to do with the possibility that abnormal fat metabolism plays a causal role So far the data are too circumstantial to warrant enthusiasm

PATHOLOGY

An understanding of the pathology of regional enteritis is particularly helpful for the clinician because it is the most specific aspect of an otherwise notably variable disease The pathologic morphology is entirely different from that of ulcerative colitis This is important to understand because both the anatomic distribution of the diseases and their clinical manifestations overlap in some cases It is possible for the two diseases to coexist but this is most unusual and specific identification of the one or the other is the important thing

Grossly regional enteritis is characterized by one or more sharply demarcated segmental thickenings of the small intestinal wall This is a slowly dynamic disease pathologically and gradual extension largely proximally is the rule In many cases however and at certain periods in most it is static The terminal ileum is the usual site of initiation and in half of the cases it is involved alone throughout the course of illness (Fig 114) In the others there is variable extension proximally and/or distally Thus only a few centimeters of bowel or several feet may be diseased All of the ileum and part of the jejunum are involved at the time of diagnosis in about 5 per cent of cases In rare instances the entire small intestine to the pylorus becomes diseased and in a few cases esophageal involvement by a process histopathologically similar to regional enteritis has been reported Ten per cent of cases show gaps in the continuity of the process so that grossly normal skip areas remain Although there is a tendency in most cases for the disease to end abruptly at the ileocecal junction there is crossing over into the cecum and colon in about 20 per cent at the time of definitive study Rarely does the whole colon become diseased

External appearances as observed at operation are those of unmistakable disease in contrast to the normal appearance of the colon with ulcerative colitis The serosa is opaque hyperemic or dark purple gray The wall is greatly thickened and by palpation it is found that the lumen has been narrowed The mesentery of the affected segment is thick and stiff due to vascular engorgement edema and fibrosis During the active phase it may be as much as a centimeter thick but later edema is replaced by fibrosis and it may then become thinner The mesenteric nodes are always enlarged sometimes up to 5 cm in diameter Characteristically all changes are sharply confined to the involved segment Because this segment has sharp limits skip areas if there be any stand out prominently When the bowel is cut open it is found that its wall is greatly thickened and the lumen is narrow and irregular Ulcerations in various stages of activity are found They are irregular in outline but tend to run longitudinally Often the mesenteric side of the bowel is most severely ulcerated Remaining islands of mucosa tend to be rather prominent but an actual polypoid appearance is unusual

Histopathologically this is a sclerosing noncaseating granulomatous obliterative lymphangitis which produces elephantiasis of the bowel wall mesentery and regional mesenteric nodes Partly at least as a result of secondary infection there is always within the bowel wall some degree of acute in

ium botulinum as the more important agents

Staphylococcal food poisoning is caused by many bacterial strains but all behave the same way Illness follows ingestion of infected food in from 2 to 7 hours The manifestations are at first entirely gastrointestinal followed by varying degrees of general collapse Cramping abdominal pain and vomiting come first The pain has a small intestinal distribution Within 30 minutes to 2 hours diarrhea appears Vomiting and diarrhea may be very severe and fluid loss is quick and of large amount There is usually a little fever great weakness and subjectively a thoroughly miserable form of general collapse Most patients are well recovered after about 24 hours but in some prostration and inability to eat may prove disabling for two to three days Staphylococcal enterotoxin can withstand boiling for half an hour, so in an occasional epidemic preparation of the food will have foiled later efforts to isolate the staphylococci by culture It is then impossible to identify the nature of the responsible agent

Cl welchii is a moderately common cause of food poisoning It acts through a number of exotoxins The usual technics of cooking do not destroy clostridial spores so that ordinarily food which has once become infected remains so until served The incubation period is about 12 hours The course of illness is entirely similar to that of staphylococcal food poisoning except that full recovery can be expected in almost all patients by the time 24 hours have passed

TREATMENT

Treatment of acute nonchemical food poisoning consists entirely of support The infectious forms are quickly self limited In the case of toxic food poisoning the patient is ridding himself of the agent far more effectively than the doctor could and such measures as gastric aspiration antidoting and purgation have no place It may be necessary to hospitalize as many as half the infected people from an epidemic however in order to furnish necessary support especially if one is dealing with people who do not live in the vicinity This is the problem encountered in convention cities military posts summer camps prisons boarding schools and colleges and these are of course the places that common mess facilities provide the best opportunity for epidemics But there are great variations in the degree of severity of different outbreaks and it is more common to find that no more than 5 per cent of patients require hospital care Intravenous fluid and electrolyte replacement rest and simple nursing are the important considerations

REGIONAL ENTERITIS

Regional enteritis (Crohn s disease) is a disease characterized pathologically by chronic fibrosing granulomatous lymphangitis of the small bowel and clinically by a chronic recurrent course with variable intestinal symptomatology chronic nutritional deficiency and mechanical abdominal complications There is no sex preference It is a disease primarily of young adults and fully half of the patients are between 15 and 30 years of age at the time of onset It has been encountered in infants as young as seven months and is not rare in very young children but among this group it tends to be an acute disease When the onset comes after the age of 60 years the disease is often mild No racial peculiarities are known There seems to be a slight familial tendency

Although not much of a specific nature may be said about etiology speculations on the subject have been full of interest There is not quite the overt emotional set up to be recognized in this disease that one encounters in ulcerative colitis at least it does not seem as important for etiologic thinking however powerful an influence it may have over the patient s total illness Because lymphedema is the common denominator for the purer parts of the pathologic picture much thought has been expended over possible mechanisms of lymphatic obstruction It is possible to produce a morphologically similar disease in dogs

are about three times as many ganglion cells as in the bowel of normal people About half of the cases show Brunner type glands in the ileal mucosa and it has been found that the recurrence rate is much higher in these

MANIFESTATIONS COURSE AND DIAGNOSIS

Even though regional enteritis is pathologically a notably chronic and often a progressive process the clinician must expect to encounter great variation in the disease s overt manifestations There is frequently an important dissociation between the amount and activity of the intestinal process and both the nature of the clinical manifestations and the apparent degree of illness Often at the time the first symptoms appear roentgenologic study reveals very extensive pathologic changes In other patients there is a fluctuating clinical course in the absence of any objective evidence of pathologic change Spontaneous clinical remissions may last for years only to be followed by relapses which seem to have no anatomic explanation Thus whatever is going on in the intestine to the clinician the patient may manifest his disease in one of three fashions as a new illness as a chronically relapsing illness or as a static chronic illness This is a disease of complications and both the clinical manifestations and the course are governed to an important degree by their supervention

In adults the symptomatic onset is ordinarily insidious often taking the form of mild periumbilical or right lower quadrant cramps plus feverish feelings in the afternoon In a significantly large group the initial manifestations simulate acute appendicitis closely enough so that appendectomy is done Sometimes the diagnosis is first made at that time from the appearance of the terminal ileum Often enough there is true acute appendicitis at the onset too or appendicitis subsequently develops in the course of regional enteritis In any case about one quarter of the patients end up without their appendix for perfectly proper reasons It is the usual experience of those who have the opportunity to observe regional enteritis in very young children that the onset is likely to be acute and the course short with spontaneous subsidence

Following the initial variable period of cramps and perhaps slight fever mild or moderate diarrhea usually appears At the start the pain tends to be relieved temporarily by a bowel movement There is usually occult bleeding but gross blood is uncommon At least 85 per cent of patients give no history of recognized bleeding from the rectum As time goes on patients who have extensive involvement of the small intestine may develop a degree of steatorrhea In rare cases a great deal of fat may be lost in the feces Severe attacks of diarrhea may supervene from time to time but for most patients the diarrhea is more a source of annoyance than a disabling feature It is common for an acute emotional upset or an acute unrelated infection such as a common cold to be accompanied by a sudden increase in the frequency of defecation

As the course becomes chronic there is significant weight loss in most cases This may be very severe and progressive but more often the weight levels off after perhaps 20 or 30 lbs have been lost There is irregular mild fever General chronic debility is the rule but its severity depends to a large extent on the nature of the various complications which may arise Although the pre illness emotional state may have been normally stable periods of emotional disturbance now appear in many patients Suicide however is rare

The findings upon physical examination depend on the stage at which the disease finds itself at the moment and on the presence or absence of complications Fever weight loss general debility and emotional upset have been mentioned as has the frequency with which the findings may simulate acute appendicitis Anemia is sometimes evident upon the initial examination In about one third of the patients an abdominal mass is palpable at some time during the course

flammation and later fibrous scarring Although it is sometimes suggested that the histopathologic picture be divided into acute subacute and chronic stages the dynamic aspect of the process and infrequency of synchronous changes in all affected parts mucosal edema hyperemia round cell infiltration *dilated lymphatic vessels and* mucosal erosion or ulceration Less edema more round cells some giant cells and considerable fibrosis characterize the progression to chronicity Secondary infection may con



FIG 114 *Regional enteritis with its usual distribution through the terminal ileum* The process is seen to stop abruptly at the ileocecal junction

make such a classification for pathologic purposes of little practical help It is said that the acute features are completely reversible and that as long as the disease remains acute it is potentially curable It is difficult to know about this At any rate at the start the process is marked largely by sub fuse the picture In the fully developed disease there is considerable fibrosis with general disruption of the anatomy plus the characteristic granulomatous process and chronic inflammation It has been found that in the myenteric plexus of the affected and unaffected portions of the small bowel there

perivisceral adhesions and rupture of this into some contiguous structure Often the process goes on at several points at once so that multiple abscesses develop within the local plastic peritonitis and a few or several fistulas are formed Both internal and external

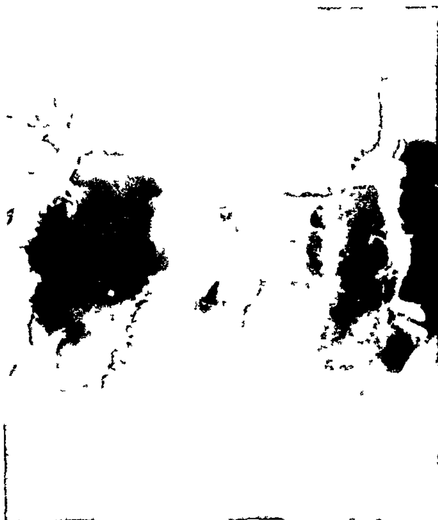


FIG 115 Characteristic roentegen features in regional enteritis with extensive ileal involvement

fistulas develop In a small portion of unfortunate patients multiple fistulas open onto the abdominal wall at once If appendectomy is done while the enteritis is active an external fistula can be expected to develop through the site of incision in about one of four cases The fistula in this case however often does not appear until several postoperative months or years have passed and it is not proper to blame all on the operation Acute appendicitis is a complication of regional enteritis and must be treated surgically when the clinical facts justify the diagnosis

The most common internal fistula is enteroenteral Any part of the small bowel the colon or the stomach may take part The result may be a serious degree of short circuiting of the ingestant stream Approximately 5 per cent of all enterovesical fistulas are due to regional enteritis Enterovaginal fistulas are not uncommon

Ischiorectal abscess and fistula are special

of the disease It is usually in the right *lower quadrant* Ordinarily the area is at least moderately tender and the mass usually appears to be fixed It may be outlined as a sausage shaped elastic tumor or the findings may be less precise presumably because of adherent structures and omental reaction Splenomegaly is sometimes found Less commonly there may be the edema of undernutrition and clubbing of the fingers

Sigmoidoscopic examination is usually normal When there are abnormal findings they are usually the nonspecific manifestations of chronic diarrhea—hyperemia edema and minor erosions In perhaps 10 per cent of cases abnormalities which can be ascribed to the primary lesion are encountered These take the form of shallow ulcers or polyps or rarely of the specific pathologic process which has extended all the way to the sigmoid colon It is a matter of considerable interest that if a patient with regional enteritis develops rectal polyps they may show histopathologic characteristics similar to those of the mucosa of the involved small bowel even though there has been no extension of the process into the large bowel

Laboratory studies of some patients with regional enteritis are normal in all spheres Sometimes mild leukocytosis appears from time to time and in a portion of cases there is persisting mild leukocytosis even though no important secondary infection appears to be present The sedimentation rate is elevated more often but seldom to a great degree When there is extensive involvement of the small bowel progressive anemia can be expected This is usually simple hypochromic blood loss anemia but occasionally macrocytic anemia of the nutritional type is encountered Hypoproteinemia may develop during a course which is marked by chronic debilitation Stool examination is normal except for chemically detectable blood Cultures show no unusual organisms Defects in absorption are unusual steatorrhea being demonstrable only in a portion of patients who have extensive chronic disease

The roentgenologic signs come close to being diagnostic when they can be demonstrated (Fig 115) Unfortunately the radiologist cannot find disease in every case and when he does the apparent severity of the process does not necessarily reflect the severity of the illness For detection barium enema is best If the disease has reached the ileocecal junction reflux of the barium suspension into the ileum rather regularly occurs In order to judge the extent of bowel which has become diseased both barium enema and barium meal are necessary The two characteristic roentgen signs are a narrow and distorted lumen and an irregular loss of the mucosal pattern The string sign is a late one produced by a fixed very narrow and rather even channel which permits only a thin stream of barium suspension to pass It usually is found in the terminal ileum and may be many centimeters long

COMPLICATIONS

The nature of the clinical course and the prognosis of regional enteritis change significantly when complications develop and there are many of these As far as longevity is concerned the prognosis of even extensive regional enteritis is rather good as long as there are no complications Although usually the disease has been overt for some time before complications arise it may remain subclinical until some rather startling change such as fecaluria suddenly appears Certain severe manifestations particularly acute and chronic blood loss severe undernutrition and extension of the disease throughout the colon are best considered due to the natural course of the disease rather than complications

The main source of complication is local destruction of the diseased bowel wall with extension of infection as a fistulous process into nearby structures Regional enteritis is accompanied by so much serosal reaction and peritoneal adhesion that acute free perforation very rarely occurs Rather the process is a progression from mucosal ulceration to mural penetration abscess formation in the

perivisceral adhesions and rupture of this into some contiguous structure Often the process goes on at several points at once so that multiple abscesses develop within the local plastic peritonitis and a few or several fistulas are formed Both internal and external

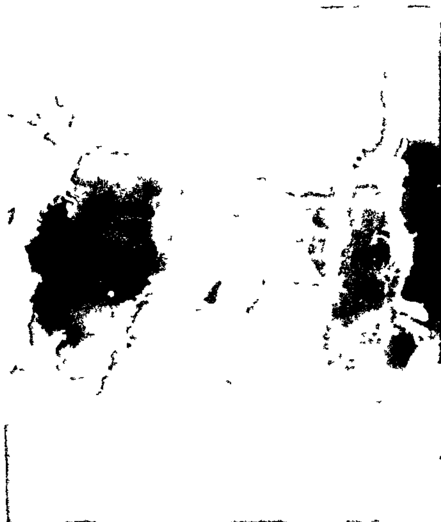


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Ischiorectal abscess and fistula are special

forms of external extension of the inflammatory process They are very common usually developing late in the course and one can expect that about one third of his patients will eventually show an important perianal or ischiorectal infection Actually in only a small portion of cases is it possible to demonstrate that the externally presenting process is continuous with a fistulous tract from the small bowel, and it must be assumed that primary anorectal disease itself is unusually common in regional enteritis

Other changes within the diseased intestine are not as important Narrowing of the lumen is a regular feature of the disease A high degree of stenosis develops here and there however actual obstruction is rare The slowly progressive cicatrization may impede the liquid stream but it is most unusual for complete blockage to supervene In this regard the roentgenologic picture usually creates much more alarm than the clinical course justifies Cancer of the small intestine is never a direct complication of regional enteritis

Rheumatoid arthritis eventually develops in about 5 per cent of cases Rarely its appearance antedates that of abdominal symptoms Skin complications other than irritation about external fistula sites are rare Erythema nodosum has been encountered in a few patients Because this disease commonly affects young people the combination of chronic anemia hypoproteinemia and other nutritional insufficiencies may affect growth general development and sexual maturation

TREATMENT

Treatment is largely a matter of supplementing deficiencies and managing complications It is in other words little more than supportive because etiologic understandings suggest no modality for direct therapeutic attack It is entirely possible that eventually a way will be found for overcoming the lymphatic blockage but until that time one might as well admit that his therapeutic gestures are not very effective

Blood replacement regularly proves to be one of the most helpful supportive measures and it is a good plan not to permit any degree of anemia to exist The fullest and most edible diet—the normal diet—is in order No dietary items should be restricted Unless there is secondary infection there is no place for antimicrobial therapy Drugs have very little to offer Simple antispasmodics may be helpful from time to time for the unusual patient who has severe cramps No type of medication seems quite as useful for the control of diarrhea as does a simple hydrophilic such as dextrose agar As mentioned the emotional complications may be very difficult and they require a good deal of interview time

There has been wide experience with cortisone and corticotropin in the treatment of regional enteritis but these drugs like radiation therapy have been discarded rather quickly by most clinicians The reasons are compelling there is the important problem of drug complications help is short lived and this help is felt only at the superficial symptomatic level The course of the disease is not altered In the rare instance of severe hemorrhage or of an acute fulminating course perhaps a brief period of cortisone therapy can make an important contribution

Surgical measures are reserved for complications The recent history of therapy of this disease is marked by unmistakable signs of growing conservatism Long ago it was shown that simple resection of a diseased segment does not cure the patient and that at times it aggravates the total problem particularly as it encourages fistula formation It is not clear whether or not surgical resection encourages extension of the disease At least 70 per cent of patients submitted to wide resection later develop orad extension of the process probably due to the natural course of the disease Recurrence may follow resection by as long as 20 years but ordinarily within a few months roentgen evidence of re establishment of the process can be found in the previously normal bowel Nutritional problems are more often aggravated than helped by resection

For fistulas of course surgical extirpation of the diseased segment and obliteration of

communications are necessary at whatever time the patient s condition is good enough to promise a good chance of healing Although this is not always technically difficult surgery it is likely to be discouraging surgery for postoperative recurrence of fistulas is common As in ulcerative colitis surgical efforts directed at anorectal complications are particularly likely to give unsatisfactory results A conservative attitude should prevail for treatment of abscesses and fistulas in the perineal area

HELMINTHOLOGY OF THE SMALL INTESTINE

There is nothing quite as natural as the relationship between man and worms Most worms are not so bad Taken as a group they are very clean and neat and physiologically they have many superior features Helminths in general are among the most common of the earth s creatures and a great many have become adapted to a parasitic existence Only a tiny portion have deigned to become messmates of man Nevertheless the helminthiases constitute by far the most common infectious diseases of man In many parts of the world worm infections are accepted as part of living In advanced societies where helminthiasis is universal among the population it is recognized that there is an important distinction to be made between worm infection and worm disease and that extant infections are not necessarily the proper target for anthelmintic effort Rather the effort is directed more rationally towards the prophylactic aspect through public health measures In this country where helminthiasis is more than a moderate problem social mores tend to encourage an unjustified attitude of emotional disturbance over the individual infection especially when a worm is seen issuing from a person and to view with self righteous denial the over all worm morbidity The result has been that harmless worm infections are treated whenever they are found even though there is risk of killing the host if the parasite is to be killed while those marvels of patience and endurance the public health officials receive little enough support from all concerned

TRICHINOSIS

Trichinosis or infection with *Trichinella spiralis* is by far the most common helminthiasis of this country and some other parts of the world The incidence among routine autopsies of adults in the United States is approximately 20 per cent as judged by diaphragm digestion concentration survey The incidence of clinical trichinosis on the other hand is very low Obviously the very great majority of infections pass unnoticed The severity of the illness depends largely on the number of larvae harbored and to a lesser degree on the host s general state of health It is said that among humans an infection which leads to migration of more than five larvae per gram of body weight will kill (Fig 116)

Brief knowledge of the life cycle is important in understanding the clinical manifestations Infection is acquired through ingestion of inadequately cooked pork or carnivorous wild game Theoretically most any meat eating mammal including the marine mammals may become infected and pass the disease along The encysted larvae in the infected meat are digested out in the stomach and the freed larvae invade and mature into the adult stage in the duodenal and jejunal mucosa This takes about a week The adults are found in all layers of the small bowel wall and some reside in the mesenteric lymph nodes For about six weeks following their maturation and fertilization the adult females larviposit Some estimates have it that each female produces a total of 1500 larvae The larvae pass into the general circulation via the thoracic duct and are then deposited throughout the body They actively break out of the capillary bed and migrate through the tissues of the body for from one to three weeks Many organs may be damaged during the period of migration one must not think of trichinosis only in terms of muscle injury The larvae can only settle down and encyst in voluntary striated muscle however and

migration seems to be carried out with this end in view Encystment proceeds commonly in the diaphragm tongue larynx chest and abdominal wall and in shoulder muscles Very little tissue reaction develops about the cysts but there is a tendency towards calcification beginning after about a year Encysted larvae or some of them remain viable about a quarter of a century

Obviously the severity of the clinical manifestations will vary greatly according to the number of viable larvae which are ingested at one time In the very small proportion of people who are made sick the incubation period extends from two days to four weeks with an average of about nine days The first symptom is often a mild gastrointestinal upset At the same time or shortly thereafter ocular manifestations often develop A characteristic early finding is edema of the upper eyelids and by about the eleventh day of infection there may be conjunctival and retinal hemorrhages Meanwhile the patient frequently has photophobia and pain on extraocular motions General soreness and pain on use of the skeletal muscles develop a day or so after the ocular manifestations and examination at that time may reveal edema of the hands forehead temples and a bright red macular rash Remitting fever lasts about a week

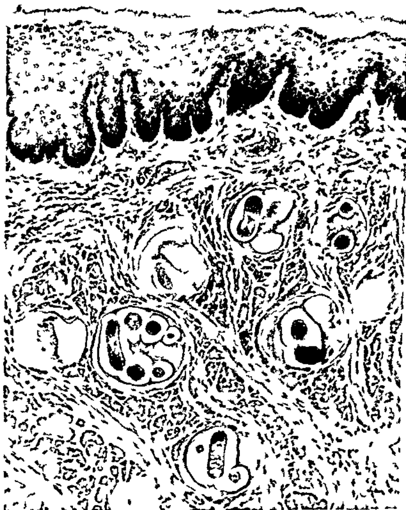


FIG 116 Human trichinosis Section of tongue taken at autopsy six weeks after massive infection The patient died of myocardial failure Note that encapsulation of the larvae has begun

with sweats and chills Brief hyperpyrexia is not uncommon

During the migratory phase of a very severe infection there are in addition great weakness dehydration prostration and sometimes cardiovascular collapse and rather sudden death Respiratory troubles due to diaphragmatic and intercostal muscle damage usually appear no earlier than the third week of illness At the same time there may be an episode of encephalitis or meningitis Although encystment does not go on in the heart larval migration may cause considerable myocardial injury When myocardial failure develops it ordinarily does so during the second month of illness at a time when clinical improvement has encouraged optimism

Early in the illness it is common to observe rapidly developing eosinophilia which may reach high levels by the end of the first week It is to be noted however that in some fulminating infections there is no eosinophilia at all Sometimes larvae are encountered in blood smears feces urine and spinal fluid during diagnostic studies

Diagnosis during the acute phase depends on bedside observation The history of pork or game ingestion the characteristic ocular signs and muscle tenderness in a patient with an acute febrile illness are particularly helpful Rising eosinophilia gives an important diagnostic hint The Bachman skin test and flocculation and complement fixation tests are useful although not diagnostically conclusive by themselves Muscle biopsy is of course not revealing until encystment has occurred After sufficient time has passed the diagnosis can frequently be confirmed in retrospect by deltoid biopsy Because about one of five adults has the infection to begin with the demonstration of many larvae not mere identification is the important thing

Treatment can be no more specific than the offering of analgesia and general support to tide the patient over the stage of encystment Obviously it is prophylaxis which is the important matter Education regarding proper cooking of meats is no doubt the most important step Government inspection of meat has boomeranged because it has engendered false public confidence in the safety of approved meat products To receive approval a batch of meat must merely show absence of trichina upon trichinopress examination of a tiny sample fragment Control of swine infection by enforced steam processing of garbage has been an important prophylactic measure It appears likely at the moment that pork may be made safe for general consumption by a routine system of irradiation with radioactive cobalt although gamma rays do not kill the larvae they sterilize the female larvae so that their ingestion would be quite innocuous It is possible that certain atomic plant wastes may eventually be utilized in this way

HOOKWORM INFECTION AND HOOKWORM DISEASE

The world over hookworm infection is said to be the most common infection of man It does not much matter just which organism receives the honor—it has been awarded to many—but it is important to appreciate that throughout the world the hookworm burden is a major health problem Nosogeographically hookworm is limited by the hibernal frost line there being no intermediate host to protect it outside of the human body In some unusual situations such as in deep mines the infection may flourish in cold climates It should be noted that people in urban as well as in a more primitive environment maintain the infection Two species produce enteral hookworm infection in man *Necator americanus* which causes the illness called necatoriasis is distributed throughout the southern United States the Caribbean area Central America eastern half of South America Africa and southeastern Asia *Ancylostoma duodenale* which causes ancylostomiasis is found through southern Europe India northern China Japan the East Indies and parts of Australia

A person acquires hookworm infection through skin contact with soil contaminated with the filariform larvae The larvae can penetrate the skin quickly producing at the

time an ephemeral local dermatitis Inside the body there is no multiplication, so that if the person has no further contact with infected soil the infection cannot become heavier as time goes on To continue their growth larvae must enter the skin lymphatics or capillaries and be transferred passively to the lungs Here they actively migrate into the alveoli and then are carried up the tracheobronchial tree If a heavy infection has been acquired at one time, the irritation of simultaneous bronchial migration of many larvae leads to coughing and expectoration so that the body may rid itself of appreciable numbers Ordinarily however the process of acquiring infection is a gradual one The larvae are swallowed become attached to the mucosa of the small intestine mature as males or females migrate about in the labyrinthine darkness find mates copulate and commence oviposition The adults measure about a centimeter in length Eggs begin to appear in the feces about six weeks following a virgin infection It is to be noted that these are eggs not ova the term ovum is a specific biologic one meaning unfertilized female sex cell while the product of a worm s oviposition is a zygote or later stage thereof a zygote membrane and two or more shell layers Hatching hardly ever occurs in the intestine If the feces are deposited on the ground and meteorologic conditions are favorable rhabditiform larvae hatch feed grow and develop into filariform larvae ready to begin the cycle again

During the period of larval migration the host responds with moderate eosinophilia If infection is acquired gradually over a long period eosinophilia persists The same is true if some of the larvae fail to find their way into the circulation and continue to migrate over a long period as they sometimes seem to do After the worms become mature however and the body is free of larvae eosinophilia regresses or disappears entirely

The hookworm burden in an individual who is not being reinfected decreases gradually as the adult worms reach the end of their life span and drop out This begins when the adults reach an age of about 9 months The last worm stops ovipositing after about 15 years Thus cure comes automatically with the passage of time unless there is reinfection

For clinical purposes it is necessary to distinguish carefully between hookworm infection and hookworm disease The important manifestation of the disease state is hypochromic microcytic anemia while in simple infection the host shows no ill effects of the worms presence As a generality it is fair to say that at least 100 *N americanus* are necessary to produce anemia in the adult and about 50 in the child There are of course wide variations *A duodenale* seems about four times as potent as a cause of anemia In very heavy infections which are unusual in this country there may be chronic debilitation with hypoproteinemia edema and retarded mental and physical development It is difficult to know how much simple dietary inadequacy contributes to the picture which is usually blamed on hookworm

Diagnosis depends entirely on demonstration of the eggs in the stool With routine use of the zinc sulfate centrifugal flotation technic for stool concentration this is a simple matter The worm s rather predictable biology permits laboratory estimation of the number of existing worms with some accuracy The female *N americanus* sheds about 9 000 eggs per day directly into the bowel lumen Conveniently *A duodenale* which is about four times as potent lays about four times as many eggs per day Hookworm oviposition is a steady process without cyclic tendency By use of the Stoll technic or some variation thereof the number of eggs passed in the feces daily can be counted and the number of worms present estimated therefrom The eggs in 0 15 ml of a suspension of 4 ml of stool (corrected for abnormal consistency) in 36 ml of 0 1 *N* sodium hydroxide are counted under the microscope Remembering that there is a male for every female even among hookworms it is easy to calculate the individual s worm burden from the total fecal output The usefulness of the Stoll count lies largely in the surveying of popu

lation groups rather than in the management of individual patients

Treatment ordinarily should not be carried out unless there is anemia Treatment is not innocuous simple hookworm infection is No practical public health principle is betrayed by ignoring subclinical infections in endemic areas because of the ubiquity of hookworm infection and the patient will of course be instructed regarding the source of his infection and the means necessary to prevent dissemination In some parts of the world where universal heavy infection is the rule particularly on the large plantations of the East Indies the best interests of the population are served by mass treatment of everybody at regular intervals

Hookworm disease is treated by both elimination of the worms and care for any deficiencies which may have developed The anthelmintic of choice is tetrachlorethylene The worm removal power of the drug is not found in clinical practice to be as great as many reports of special investigations suggest If it is used correctly one can expect a dose to rid the patient of about half his worms For further treatment it is best to *repeat with tetrachlorethylene rather than* to resort to the more potent but more toxic drug carbon tetrachloride If there is ascariasis in addition to hookworm one must use hexylresorcinol to eliminate the ascarids first because the possibility that tetrachlorethylene may stimulate ascarids to migrate through the bowel wall is a real one Hexylresorcinol is in itself a moderately effective drug against hookworm

The recommended course of treatment consists of heavy purgation with about 30 gm of sodium sulfate one evening 4 ml of tetrachlorethylene by mouth early the next morning omission of breakfast and repeat sodium sulfate purgation three hours later For judging the success of treatment stool checks for eggs should be put off for about two weeks because the drug may obtund the ovipositing powers of worms which have not been eliminated

ASCARIASIS

Infection with *Ascaris lumbricoides* is very common throughout the world in cold as well as warm areas There are no intermediate host and no free living stage and the disease can flourish wherever filth infections are common In addition the eggs are very resistant to the elements as well as to many of the technics commonly used to preserve and prepare food Because each female lays about 200 000 eggs daily preservation of the species seems assured The clinical importance of ascariasis lies almost entirely in its complications For *all their fierce appearance* and *size—up to* 30 cm in the male and 40 in the female—these are ordinarily gentle guests

Infection is acquired through food or drink which has become contaminated with eggs which have completed their necessary period of extracorporeal embryonation A larva *emerges from each egg when it reaches the* duodenum The larvae penetrate the small bowel wall enter the circulation and are carried to the lungs Here they migrate out into the alveoli causing a degree of damage which depends on their numbers Ascaris pneumonitis is recognized as a clinical entity *More often if there is a pulmonary* manifestation it takes the form of a simple Loeffler s phenomenon Occasionally the larvae settle in other organs particularly the brain spinal cord and kidneys where they are capable of causing considerable damage The great majority pass up the tracheobronchial tree are swallowed for the second time and come to lie in the lumen of the small bowel where they mature and spend the rest of their lives By this time they have moulted four times The females having been fertilized begin to lay eggs about two months after hatching

Within the small bowel the adult worms do little harm They cause no anemia and after the phase of larval migration has passed there is not even eosinophilia One is not often justified in ascribing gastrointestinal symptoms to the mere presence of ascarids It is common for the patient first to become

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FISH TAPEWORM INFECTION

The fish tapeworm *Diphyllobothrium latum* causes a subclinical or very mild infection which is known as diphyllobothriasis or bothriocephaliasis It is moderately fastidious in its selection of the two intermediate hosts necessary for its development therefore its distribution is limited The Baltic and Scandinavian countries Russia Switzerland Israel Japan Chile and the Great Lakes and middle western regions of Canada and of this country are the main endemic areas Although actual illness is almost never produced by the mere presence of the worms diphyl obothriasis has stimulated special interest because of the megaloblastic anemia which sometimes accompanies it

The adult worms which grow up to 30 feet in length live folded back and forth within the ileum Commonly there are two to four worms per infected person Eggs are shed from the bisexual proglottids 3000 to 4000 of which make up the worm s strobila and if they reach water the eggs hatch in about two weeks as ciliated larvae (onchospheres) A copepod may ingest the onchosphere Thereupon the parasite develops further (procercoid) only to be swallowed with its host the copepod by a fish In this country the wall eyed pike great northern pike white fish and carp seem most important in perpetuating the cycle In the fish the larva settles down in muscle tissue (sparganum larva) and grows to a length of about 6 mm

A person acquires infection by eating an insufficiently cooked fish which contains sparganum larvae In the United States and elsewhere a common way this is accomplished is through the sampling of raw gefulte fish during its preparation Along the eastern coast of this country fish from the Great Lakes are commonly used for preparing gefulte fish and the infection in this region is limited largely to Jewish women Following their ingestion the larvae mature quickly and oviposition begins in about three weeks The adult worms may live for 10 years Although it is possible for a bunched up mass of strobila to cause obstruction of the ileum and although the adult has been discovered in the gallbladder in the great majority of cases the patient is not aware of illness until she notices proglottids in her stool There is so little body reaction that eosinophilia is uncommon

About 1 of 500 infected persons develops megaloblastic anemia of the pernicious anemia type Although it has been reported in the Great Lakes region of Canada and the United States the great majority of cases have been encountered in Finland There has been an argument of classic proportions over the significance of the association of worm and anemia The anemia seems exactly like pernicious anemia except that free gastric acid has been demonstrated in about 20 per cent of the cases Subacute combined cord degeneration occurs The anemia clears spontaneously in most cases when the worms are expelled The current belief is that the tapeworm plays an important etiologic role through absorption of its host s vitamin B supply The vitamin B content of the worm is very high

There is no clinical need to treat the great majority of patients A unique public health problem is created by the worm s biology however and routine treatment is recommended In many localities sewage is not processed but merely turned into a handy nearby stream or lake However fastidious the patient may be under these circumstances he is directly assisting dissemination of his parasite through pollution Inspection of commercial fresh water fish by public health agencies has never been found practicable and therefore education of the public regarding the inadvisability of consuming raw fish is especially important Freezing fish for 24 hours at minus 10 C insures protection but thorough cooking is the important measure

The best drug for eradication of fish tapeworm infection as well as for treatment of human hymenolepiasis and taeniasis is Atabrine (quinacrine) Oleoresin of aspidium has cured thousands of infections and many

aware of trouble when he notices an adult worm in the stool or in vomitus

The complications may be very severe although fortunately they are rare considering the ubiquity of the infection They are due to active migration of the adult worms or to bowel *obturation by their mass It is not clear* what local conditions may stimulate abnormal migration but because when one worm *moves all or most may move* it is certain that the stimulus must come from the host not rare Sometimes spontaneous release occurs apparently through movements of the worms

Diagnosis depends on identification of the eggs (Fig 117) upon stool examination or recognition of evacuated adults Worms that are passed may be the only ones present An all male infection is a statistical possibility if infection is light In all female infections the unfertilized eggs are easily recognized as such

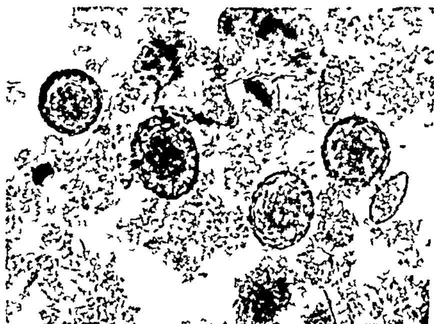


Fig 117 Four *Ascaris lumbricoides* eggs On the right there are two *barrel shaped Trichocephalus trichiuris eggs*

The worms may end up in many bizarre locations and cause strange clinical manifestations They may burrow into the psoas muscle and down into the thigh follow an esophagotracheal fistula into the lung or penetrate the pregnant uterus and the fetus it contains Much more likely is simple migration through the bowel wall into the peritoneal cavity with production of the picture of acute perforation and peritonitis At laparotomy in such cases large numbers of ascarids may be found free in the peritoneal cavity Migrations into the appendix and up into the bile ducts have been reported many times Mechanical obstruction of the bowel by balled up worms is

Ascariasis should be treated whenever it is encountered because of the potential complications Hexylresorcinol is the most satisfactory anthelmintic It is used with a high degree of safety but because it is moderately corrosive toward squamous epithelium one must see to it that the patient does not chew the capsules For adults 1 gm is given during the morning fast followed in three hours by heavy sodium sulfate purgation (about 30 gm in a glass of water) The cure rate following one course of treatment is found in clinical practice to be about 35 per cent which is far below the claims of special investigational studies

is the emotional reaction which the patient often shows upon discovering in his stool single or chains of proglottids A great many people find this to be an upsetting experience Eggs of the beef tapeworm are innocuous for humans being able to develop only when ingested by cattle buffalo llamas and a few other ungulates

For diagnosis examination of either a mature proglottid or the worm s scolex is necessary *Taenia* spp eggs show no specific identifying features (Fig 118) Proglottids are ordinarily available either having been saved and presented to the doctor by the patient or being obtainable in quantity following simple purgation when routine stool examination has demonstrated the presence of *Taenia* spp eggs The specific characteristic of the gravid proglottid is the presence of 15 to 20 paired primary branches or diverticula extending laterally from the main stem of the uterus These are counted with varying degrees of ease with the help of a hand lens when the proglottid is squeezed between two glass slides If in *Taenia* spp infection a scolex should become available the absence of hooklets indicates *T saginata* rather than *T solium*

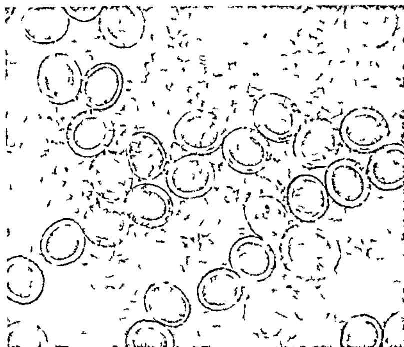


Fig 118 Eggs of *Taenia saginata* Those of *T solium* are identical

Treatment is desirable if the patient becomes upset over his worm Otherwise it is not necessary although the patient must understand that his feces are infectious for cattle Specific therapy is the same as that already outlined for fish tapeworm This is a resistant worm and often enough several courses of therapy are necessary to eliminate the scolex This in itself is disturbing for the patient and as times goes on everyone concerned tends to become upset over ineffectiveness of therapy The patient is encouraged when he sees great masses of worm eliminated after a course of treatment but terribly discouraged when a few months later he suddenly discovers proglottids once again in his stool At the outset it must be explained that the aim is to eliminate the worm s tiny head and that success is not measured by the length of strobila recovered Again it may be pointed out that search for the scolex in the products of purgation can be most misleading in de

clinicians feel a sentimental attachment to it but Atabrine seems to have an advantage in safety Atabrine is given in a rather large dose however and is not entirely innocuous A small proportion of patients react briefly with dizziness restlessness and confusion Many become nauseated and some vomit This is especially true of children who are likely to be more sensitive than adults

The best routine for adults includes sodium *sulfate (30 gm) purgation the evening be*fore 0 8 gm of Atabrine plus 6 gm sodium bicarbonate with two or more glasses of water in the morning followed in three hours by repeat purgation If vomiting defeats the effort one may substitute oleoresin of aspidium or hexylresorcinol for the Atabrine Transduodenal intubation of the Atabrine may circumvent the nausea and vomiting problem but it does not always work

Hunting for the tapeworm head or scolex in the products of purgation following treatment is a fetish with some people There is no harm in the search—it can be very interesting—but not much is gained thereby There often is more than one worm and the hunter cannot be sure of cure no matter how many scolices his bag includes It is better to give remaining worms several weeks to recover and regenerate and then to examine the stools again for evidence of persisting infection

DWARF AND RAT TAPEWORMS

Hymenolepis nana the dwarf tapeworm and *H diminuta* the rat tapeworm are cosmopolitan parasites The former is almost exclusively a tapeworm of man and is very common The rat tapeworm is only incidentally a human parasite and is a rare clinical infection It can be acquired only through accidental ingestion of one of a great variety of arthropod intermediate hosts which has picked up the infection from a rat or mouse In man the adult rat tapeworm which is very narrow may reach a length of 60 cm

H nana is the only cestode which regularly passes both its larval and adult stages in man No intermediate host is required In fection is acquired from food or drink contaminated by human feces Swallowed eggs hatch in the stomach releasing larvae (onchospheres) which penetrate and settle within the jejunal mucosa There the larvae metamorphose into cercocysts which re-enter the jejunal lumen attach themselves to the mucosal surface and mature The worms grow no longer than 4 cm The host usually responds with moderate eosinophilia It is *claimed that toxic symptoms may develop* but this is doubted It is interesting that the dwarf tapeworm is encountered largely in children There is some suggestion that adults are normally resistant

Diagnosis is established by demonstration of the eggs upon stool examination If the decision is to treat the regimen suggested for fish tapeworm proves satisfactory

BEEF TAPEWORM

Taenia saginata the beef tapeworm has world wide distribution Man is the only definitive host Infection is acquired through ingestion of inadequately cooked beef which contains the larval stage (cysticercus) Cattle are usually no more than lightly infected so the human host often harbors only one adult worm This feature parenthetically renders beef inspection quite useless as a prophylactic measure

When man eats a viable cysticercus which may measure up to a centimeter in diameter it evaginates in the upper small intestine becomes attached to the mucosal surface and matures An average worm measures about 2000 cm in length As it grows at the scolex neck gravid proglottids drop off the free end and are passed with the stool This begins two to three months after infection Sometimes mature proglottids migrate actively through the anus and the patient may rarely discover one upon his person Proglottids sometimes disintegrate within the intestine so that the patient s stools contain eggs from time to time

The presence of *T saginata* in the intestine rarely produces any local or systemic effects In some patients there may be mild or moderate eosinophilia The main clinical problem

extending laterally from the main uterine stem If the scolex should become available its tip will be found to have a crown of hooks

Obviously pork tapeworm infection must be treated to a cure whenever encountered The regimen described for fish tapeworm is recommended There may be considerable resistance on the worms part Elimination of most of the strobila affords protection for the patient for the time being even if the scolex is not immediately eliminated but because it is not possible to judge how many worms are present it may not be until the worm has grown out again and begins shedding proglottids that one is warned of persisting infection Stool examination for eggs is ordinarily more fruitful than it is in the case of beef tapeworm infection and it is wise to follow a course of treatment by stool studies on the chance that they may warn early of the necessity for another therapeutic effort

THE ABSORPTIVE STEATORRHEAS

The steatorrheas have the reputation of being a rather unintelligible group of diseases Perhaps this is because in medicine it is possible to define most diseases in moderately precise clinical terms however uncertain etiologic and pathologic mechanisms may be Among the various steatorrheas however it is found that specific entities are hard to define even clinically and that different types seem to merge with each other in a confusing way Actually the gastroenterologist need not feel too insecure over the steatorrheas if he approaches each patient with the idea of determining what abnormal process is going on rather than trying to force the case into a specific category The specific diagnoses such as sprue and celiac disease are necessary and must be applied whenever possible but only if they fit

Steatorrhea is merely a manifestation indicating simply an excess of fat in the feces The causes may be classified this way

I Digestive faults
  A Pancreatic insufficiency
  B Biliary insufficiency
II Absorptive faults
  A The three classical forms
    1 Celiac disease
    2 Idiopathic steatorrhea (nontropical sprue)
    3 Tropical sprue
  B Spontaneous mechanical
    1 Short circuiting fistulas
  C Surgical
    1 Total and partial gastrectomy
    2 Small bowel resection
    3 Short circuiting operations
  D Infiltrative inflammatory infectious
    1 Regional enteritis
    2 Tuberculosis
    3 Giardiasis (rare)
    4 Whipple s disease
    5 Tumor infiltration (pseudo leukemia gastrointestinalis)
    6 Amyloidosis (rare)
    7 Scleroderma
  E Mucosal atrophy
    1 Avitaminoses
    2 Pernicious anemia

GENERAL MATTERS AND DIAGNOSTIC METHODS

On a usual diet the normal adult s stool contains from 5 to 7 gm of fat Loss of more than 10 gm day after day can be considered steatorrhea On a test diet containing 50 gm of fat daily a normal subject absorbs at least 95 per cent of the fat He will however lose about 3 gm daily in the stool The excess is accounted for by bacterial synthesis and by fat passed out by the normal exfoliation of intestinal mucosal cells

When bile emulsification and pancreatic digestion are efficiently carried out then almost all ingested fat is normally absorbed Only monoglycerides and fatty acids are able to pass from the intestinal lumen into the mucosal cells Within the cells triglycerides are reconstituted Transport via the lacteal vessels and thoracic duct system directly to the blood stream with temporary circum

ciding the point Once the decision to treat has been made the gastroenterologist can do nothing but see it through There is no way to determine cure with certainty except to wait patiently for perhaps two months to see if proglottids reappear Stool examination for reappearance of eggs does not often prove worthwhile

PORK TAPEWORM

Infection with *T solium* is potentially a very dangerous illness Fortunately it is rare although it has been reported from most areas of the world The problem presented is that man serves as an adequate host for the larval stage as well as being the only host for the adult tapeworm Ordinarily the worm s larval phase is spent in the pig and man acquires the infection by eating inadequately cooked pork which contains larvae (cysticerci) The cycle completes itself like that of the beef tapeworm The adult worm measures about 700 cm in length and if undisturbed it may live for a quarter of a century It ordinarily attaches itself to the jejunal mucosa Infected pork often contains great numbers of cysticerci (measley pork) and the human host may therefore acquire several worms This feature is not all detriment however because it renders pork inspection quite effective for detection of dangerous meat

The mere presence of adult pork tapeworms in the intestine is of no more consequence than the presence of beef tapeworms Internal hyperinfection is possible however and by this mechanism eggs shed from the worm are retained in the bowel until they hatch whereupon the larvae invade the intestinal wall More commonly the patient or some other person eats food contaminated with eggs from his feces When this happens it is common for great numbers of eggs to be ingested all at once The larvae are released in the proximal small intestine and enter the blood stream after penetrating the mucosa They then undergo hematogenous dissemination coming to rest in various parts of the body Here they develop as cysticerci and grow to a diameter of about 1 cm The resulting illness is known as cysticercosis There may be thousands of cysticerci per infected individual Although any tissue seems to be a proper site for larval growth the more commonly invaded are the subcutaneous tissues striated muscle liver lungs eyes heart and central nervous system It is not to be inferred that all people who harbor adult *T solium* have this misfortune in store for them Human cysticercosis is a rare disease

The clinical picture of cysticercosis is one which results from many expanding lesions peppered at random throughout the body The manifestations may be largely cerebral cardiac pulmonary renal or all combined Superficially placed cysticerci may be palpable The mortality rate is high It is governed of course by the number and locations of the lesions In some patients cysticercosis remains subclinical and is discovered only incidentally at autopsy

Diagnosis of cysticercosis is usually discovered with surprise when an unexplained subcutaneous nodule is removed for histopathologic study Occasionally the diagnosis is predictable when the presence of an adult worm is known There often is rather severe eosinophilia which may give a diagnostic hint When the patient is studied for the first time long after the invasive stage has passed routine chest roentgenogram may show a pattern of scattered soft tissue calcifications which permits the radiologist to suggest the diagnosis There is no specific treatment for cysticercosis except surgical extirpation of individual lesions which are causing pressure problems

The adult worm s presence is detected by discovery of eggs or proglottids in the stool Examination of the latter is necessary for specific identification the characteristics of the eggs being nonspecific Whenever routine stool examination reveals eggs which morphologically are compatible with those of *T solium* there is an important obligation to obtain proglottids for identification As pointed out above this can almost always be done by purgation The proglottid s gravid uterus has up to 13 paired primary branches

steatorrhea is present in several forms The normal fecal values computed for wet weight are for fatty acids 1 to 11 per cent for total fat 7 to 20 per cent and for neutral fat 40 to 60 per cent of the total fat

COMMON FEATURES OF THE CLASSICAL TYPES

Celiac disease tropical sprue and idiopathic steatorrhea are the important types of absorptive steatorrhea The other forms listed in the classification above which are much easier to understand than the three classic types are discussed elsewhere The three types under consideration here have many features in common The basic similarity is that fat has been adequately prepared for the small intestine by the bile and pancreatic secretions Digestion has been efficiently carried out and when it reaches the small intestine the fat is present in a finely emulsified state To the patient the consequent change in stool appearance and odor is often obvious but it is important to understand that latent steatorrhea is not uncommon Even though the patient may show many overt evidences of absorptive disease stool appearances may be superficially normal

In addition to or as a consequence of the fat absorption defect there are other absorptive faults and chronic deficiencies The flat oral fat tolerance and plasma turbidity curves are paralleled by a flat oral glucose tolerance curve Utilization of absorbed carbohydrate is apparently normal at least as it is measured by the intravenous glucose tolerance test Negative nitrogen balance is reflected in hypoproteinemia Experimentally there is delay in absorption of urea Iron riboflavin nicotinic acid pyridoxine and folic acid deficiencies are common Hypoprothrombinemia often develops Calcium is lost in large amounts as calcium soaps of the fatty acids Hypocalcemia is found in the majority of patients in some to periodic tetanic levels and the chemical conditions necessary for development of osteomalacia frequently exist Compensatory hyperparathyroidism seems to follow in some cases The diarrhea itself accounts for variable loss of potassium sodium and the other easily diffusable elements although they are ordinarily kept well in balance throughout the chronic phases of the diseases by the usual mechanisms of physiologic conservation—by tissue catabolism in the case of potassium and renal regulation in the others

The endocrinologic deficiencies which are common to any starvation state are felt by some patients Altered fat metabolism has an important influence over production of the steroid hormones and in particular it seems that fat absorption exerts control over adrenal hormone production Some degree of compensatory hypopituitarism probably develops in most patients with chronic steatorrhea The usual clinical manifestations are amenorrhea variable pigmentation and a degree of chronic hypotension Excretion of 17 ketosteroids is diminished sometimes

ROENTGENOLOGIC FEATURES AND THE DEFICIENCY PATTERN

Roentgenologic examination of the small intestine furnishes no diagnostic help for the absorptive steatorrheas yet certain abnormalities which may be encountered in patients who pose unresolved diagnostic problems may raise the possibility of absorptive difficulties To the radiologist the functional lumen of the normal ileum is a little narrower than that of the jejunum Because the small intestine is so efficient at water absorption a thin barium suspension which enters the jejunum is quickly converted to a pasty mass Therefore the normal jejunal mucosal pattern is fine and feathery upon barium meal study (Fig 119) and the normal ileal pattern is heavy coarse and clumped (Fig 120) The normal ileal mucosal pattern shows up as fine and feathery however if the contrast medium remains liquid as when transit time is rapid or when the medium is introduced as an enema and refluxes back into the ileum

It is important to understand these normal variations before attempting to evaluate the small bowel deficiency pattern about which

vention of the liver is a process familiar to all

Chyme and chyle wait for no man and during and immediately following absorption examination of the peripheral blood gives information regarding the rapidity of the process It may be studied by counting the *circulating* chylomicrons to obtain a chylo microgram but this test is too crude to be of much help A much better way is to take photometer readings of the plasma s optical density just before and at hourly intervals after a butter meal This may be considered an excellent as well as easy way of measuring fat absorption The vitamin A absorption test is also considered to be a good test for measuring fat absorption For this it is assumed that absorption of vitamin A parallels that of dietary fat and detection of a rise of at least 10 I U of vitamin A per 10 ml of blood following the test dose signifies normal absorption

Many of the absorptive steatorrheas are due to simple mechanical blockage of the small intestine s absorptive surface and con sequently there is also interference with carbohydrate and protein absorption Ordi narily fat requires more time and a greater surface for efficient absorption and follow ing bowel resection absorption of fat is impaired more than that of the other two constituents Nevertheless in many of the absorptive steatorrheas carbohydrates also suffer significantly This is not necessarily complete failure of absorption but chronologic lag in the process Comparison of the re sults of standard oral and intravenous glucose tolerance tests is a way to measure the delay It gives important information for evaluation of patients with any of the malab sorption syndromes A promising simple screening test which necessitates no veni punctures is the *d* xylose test A 50 gm dose of *d* xylose is given orally and urine is collected for five hours Normal people will absorb and excrete *d* xylose while those with the sprue like syndromes will not

Much can be learned about the diagnosis and the severity of the process from gross inspection and more detailed analysis of the stool in most instances It is important to bear constantly in mind the coprologic dis tinction between digestive and absorptive forms of steatorrhea in the former the unaltered fat tends to lump in the stool while in the latter the fat is well digested and finely dispersed The characteristic color bulk flocculent consistency and foulness in outspoken cases are well known from fre quent scriptive comment although unfor tunately many gastroenterologists never have the opportunity to become thoroughly familiar with the variations from actual experience An excessive fat content does not necessarily cause any grossly recognizable abnormality however and often the clinician can obtain no hint of the condition from the patient s description or from personal inspection of the feces

Study of the whole patient by means of precise microscopic and chemical testing of the feces offers problems in both technic and interpretation Direct microscopic ex amination with the help of Sudan III stain gives very crude information regarding the amount of fat present In absorptive stea torrhea large numbers of fatty acid crystals are found and this finding is helpful as quick proof of fat digestion For fat balance studies some clinicians favor a 50 gm fat diet and others the 111 gm Schmidt diet Because of the vagaries of intestinal trans port a proper fat balance study must extend over at least 72 hours and stool markers, such as carmine dye or glass beads cannot be depended upon to furnish valid informa tion regarding the fecal residuals of a par ticular meal or series of meals For measurement of the amount of unabsorbed fat some technicians prefer to carry out fat determinations on desiccated stool specimens and others use the simpler but less precise wet weight methods The metabolic vagaries themselves make a sham of efforts to obtain more precise methods for stool analysis and most clinicians are content with the information furnished by wet weight technics Fat in the feces of a person with absorptive

bowel mucus in part to diminished small bowel tone and in part to decreased motility The roentgenologic abnormality is an interesting phenomenon but it is not useful for measuring illness Its discovery is however a tip off to the possibility that there is disease of a deficiency nature present



Fig 120 Normal roentgen pattern of the ileum as it appears when the barium suspension is taken by mouth By this time the suspension has been dehydrated to a pasty mass

OTHER FEATURES OF CELIAC DISEASE

Celiac disease and idiopathic steatorrhea (nontropical sprue) are generic cousins but no significant relationship can be found with tropical sprue It seems permissible to look upon celiac disease as infantile idiopathic steatorrhea It is not a tropical disease

Ninety eight per cent of cases of celiac disease make themselves known before the patients are four years of age and onset comes before the age of six months in about one third There is some tendency towards a familial incidence to constitutional susceptibility to the disease The important clinical features are a tremendous output of obviously steatorrheic stools and a variety of



Fig 119 Normal roentgen pattern of the jejunum

there has been so much comment (Fig 121) In sprue beri beri and some other deficiency diseases barium suspension taken by mouth becomes puddled or massed in a series of separated clumps when it reaches the distal jejunum and ileum There is dilatation of the middle and *distal jejunum and segmentation* is excessive Bowel tone and motility are depressed In sprue there is thickening of the valves of Kerckring (valvulae conniventes) plus hypersecretion The roentgenologic picture tends to return to normal when the clinical illness is adequately treated

The explanation for the deficiency pattern is believed by most observers to be simply altered small intestinal dynamics It has been shown however that flocculation *of an ordinary barium suspension is con*trolled at least in part by the amount of mucus which it encounters in the bowel Therefore the deficiency pattern may be due in part to an increased amount of small

Treatment is directed along rather precise lines dictated by etiologic understandings and these constitute a very interesting story It is believed that the main etiologic factor has to do with excess production of mucus by swollen epithelial cells of the small intestinal mucosa of certain susceptible babies in response largely or entirely to irritation by the gluten fraction of wheat rye and probably other grains The mucus appears to form a mechanical barrier to absorption and in addition the altered surface cells themselves appear physiologically ineffective Intestinal motility is disturbed and this too interferes with absorption

The first point of treatment therefore is preclusion of all cereal grains and cereal products In addition to the important specific effect it is common experience to find that preclusion of wheat rye and oats ameliorates the anorexia vomiting and diarrhea which are such problems in the child with celiac disease The patient makes particularly good use of bananas especially at the start of treatment for reasons unknown Later on in the course all fruits are well utilized Protein other than gluten is well tolerated in all forms There is no good reason to eliminate fats from the diet although clinical results are better to begin with if only small amounts are used and if emphasis is placed on unsaturated fats such as olive oil in place of saturated fats as butter

Bearing these points in mind the patient is placed on as large a diet as he will tolerate The diet should be maintained for about 18 months and thereafter there can be liberalization as governed by the clinical course Eventually a normal diet is well tolerated Meanwhile there are many deficiencies to be attended to especially those due to fat soluble vitamins calcium and iron While there is uncontrolled steatorrhea adequate supplementation is not possible but after a few weeks of gluten free feedings extra vitamins calcium and iron are tolerated and utilized Neither folic acid nor vitamin B_{12} seems to offer any special benefit although response to these agents is probably best considered unpredictable until after they have been given a trial Mental and physical recovery from celiac disease are possible but not often are they complete Nevertheless elimination of gluten by itself results in remarkable improvement in intestinal absorption among about 90 per cent of the babies with gratifying response in all clinical manifestations If supplementation therapy is successful the prognosis is very good

OTHER FEATURES OF IDIOPATHIC STEATORRHEA (NONTROPICAL SPRUE)

This chronic disease usually makes itself known only after the patient has passed the age of 35 years There is no important sex preference Fully half of the patients give a history which suggests celiac disease in childhood and there are many features common to the two diseases This is not a tropical disease

Diarrhea of the characteristic steatorrheic type is the first complaint of half of the patients The common pattern calls for repeated defecation early in the morning with relative freedom at night Often there are explosive attacks of diarrhea without pain but often with moderate tenesmus As in all of the steatorrheas a certain portion of patients have bowel habits which seem to be entirely normal and in the case of idiopathic steatorrhea this proportion amounts to about 20 per cent If there is abdominal discomfort it is mild It is due to gas distention secondary to the fermentative process which is frequently active in the bowel Weight loss is regularly an important feature and it may be profound Weakness and mental torpor may be early manifestations and they worsen with the progress of the disease It is characteristic for the appetite to remain good and in some patients it is tremendous Some of the biggest appetites observed in gastroenterologic practice are encountered in this group

Specific deficiencies manifest themselves in important ways Some of the weakness may possibly be due to potassium deficiency Almost all patients demonstrate some degree

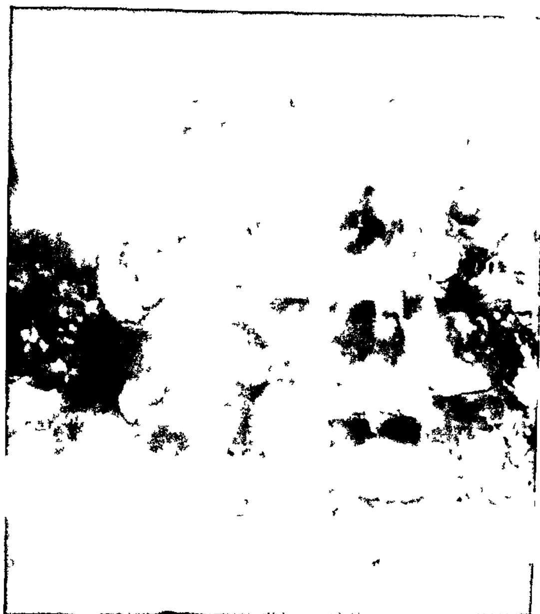


Fig 121 Roentgen findings in the small intestine in case of idiopathic steatorrhea This is the deficiency pattern

nutritional problems There are anorexia and periodic vomiting Abdominal distention is characteristic and this plus very thin buttocks gives the child a typical undernutrition habitus Growth retardation and general failure to gain weight may be very serious As a result of chronic vitamin D and calcium deficiency osteomalacia rickets dwarfism and spontaneous fractures may develop Hypocalcemic tetany is common in the untreated infant Lenticular opacities have been reported but apparently they are rare

Anemia does not constitute quite the problem in celiac disease that it does in the adult steatorrheas Anemia is very common but it is almost always of a mild iron deficiency microcytic type Nutritional macrocytic anemia is rare There appears to be an iron absorption fault probably in part explained by functional hypochlorhydria or achlorhydria which is known to exist in some of these babies Unfortunately there is not detailed information available on this matter

men For these reasons it is believed that cortisone at present has an important part to play in its treatment

When absorptive efficiency becomes improved it is important to carry out heavy supplementation with multivitamins potassium calcium and iron Large doses of vitamin D must be given over a long period if calcium supplementation is to be effective Parathyroid hyperplasia resolves spontaneously with calcium restoration Often the patient does not tolerate oral iron at all well and it is usually best to begin with the intravenous preparation There is no specific treatment for the blood disease of idiopathic steatorrhea and response to various drugs cannot be predicted Some patients who have megaloblastic anemia receive a great deal of help from folic acid and others do not Some observers have noted good results with vitamin B supplementation even in patients without megaloblastic anemia Response to liver injections is disappointing

OTHER FEATURES OF TROPICAL SPRUE

Although clinically and chemically there are few differences between idiopathic steatorrhea and tropical sprue these differences have special significance Tropical sprue itself shows varying manifestations in different parts of the world Nosogeographically it is important to note that although this is a disease of the tropics and subtropics in some warm areas it affects the native population to a significant degree while in others it is largely restricted to foreign immigrants

Here too the cause of absorptive difficulties is believed to be excess production of mucus by the small bowel with swelling of the surface mucosal cells and formation of a mechanical barrier against mucosal absorption The mucous fractions obtained by aspiration of the small intestine in sprue differ from those found in the normal person It is not clear whether absorption interference comes from the chemical nature of the mucus its viscidity or merely its amount Neither gluten nor bacterial activity plays any part in its stimulation All theories of a micro organismal factor in sprue etiology have effectively been laid in their graves and it does not appear that they will rise again There is suggestive epidemiologic evidence that rancid fats specifically certain short chain fatty acids which are eaten in some parts of the world may furnish the irritant factor It should be noted for instance that among British forces in Hongkong soldiers who regularly mess on locally procured provisions are notably susceptible to sprue but sailors who are supplied entirely with food brought from England do not get sprue

The clinical peculiarities of tropical sprue which distinguish it from idiopathic steatorrhea are these Sprue at times behaves in mild epidemic form especially when a group of immigrants from northern climes settle together in the tropics It is characteristic for patients at the outset to be mean tired so that they often get into trouble with the law or find themselves in the hands of a psychiatrist Problems of calcium deficiency are not as prominent possibly because of the effects of sunshine In Puerto Rico hypocalcemia is rarely encountered In some other parts of the world as many as one quarter of the patients may have roentgenologic evidence of bone disease—osteoporosis Milkman s syndrome or adult rickets Hypocalcemic tetany is rare in all regions compared with idiopathic steatorrhea Hypoprothrombinemia similarly is unusual in sprue Plasma vitamin B levels on the other hand are very low—lower even than they are in pernicious anemia Atrophic and inflammatory lesions may extend throughout the gastrointestinal tract from tongue to rectum and secondary glossitis and patchy atrophic gastritis are common Permanent achlorhydria however does not seem to be any more common than it is in other gastrointestinal patients Study of the stomach s exfoliated surface cells obtained by brushing the mucosal surface shows megaloblastic appearing cells similar to those which can be recovered in pernicious anemia Fat

of glossitis The tetany of hypocalcemia similarly may be demonstrated in most Demineralization of the bones occasionally with spontaneous fractures is characteristic Secondary hyperparathyroidism appears to develop in these cases Hypoprothrombinemia *due to avitaminosis K is usually present* even in patients who do not appear very sick and hemorrhagic manifestations may result Steroid hormone deficiency with the secondary hypopituitarism of fat starvation manifests itself in amenorrhea skin pigmentation with quick tanning and arterial hypotension All are common Less prominent clinical features are seborrheic dermatitis mild fever and splenomegaly It is sometimes said that the last occurs in 10 per cent of the cases but this figure is probably too high

There almost always is anemia and in some patients the degree of hematologic disease is severe In at least two thirds this is nutritional macrocytic anemia believed due simply to failure of absorption of the extrinsic factor The marrow often is megaloblastic and it is occasionally found that the peripheral blood shows morphologic characteristics identical to those of pernicious anemia Decreased erythrocytic fragility and mild leukopenia are common Iron deficiency anemia is the problem among a small portion of cases

The depressed absorptive capacity of the intestine in this disease *may be startling* Ordinarily one may expect that from 25 to 50 per cent of the ingested fat can be recovered from the stool Values as high as 85 per cent have been reported Plasma turbidity and oral glucose tolerance curves are always flat The blood is low in fat protein *calcium phosphorus and potassium* Fecal calcium phosphorus sodium and potassium are usually elevated Nitrogen absorption may amount to only half of the intake a rather remarkable thing It is interesting that amino aciduria is sometimes demonstrable

The etiologic significance of gluten does not appear to be quite as clear cut here as it is in celiac disease Clinical and chemical response to a gluten free diet varies considerably from patient to patient It can be shown that gluten clearly hurts some patients does not hurt others and apparently must be fed with a high starch diet if it is to have any effect on a third group It is common experience to find that a gluten free diet helps those cases of idiopathic steatorrhea which have been preceded by celiac disease much more than those which have not The gluten injury mechanism seems to be the same as that which operates in celiac disease specific irritation of the small bowel mucosal cells leading to secretion of a poorly penetrable mucus barrier to absorption

For planning initial treatment advantage should be taken of the probability that a gluten free diet will help Subsequent experimentation may show that the cereal grains can be tolerated and that there is no need to withhold this source of nourishment Fat is best limited to about 50 gms daily These patients tolerate milk and butter well Ideally the diet should contain large amounts of all elements except fat in an attempt to make up for the pandeficiency problem Unless the specific irritant which is responsible for stimulating the absorption barrier can be detected and eliminated however nothing can be gained by increasing dietary intake The excess food will not be used If *it is not gluten* the irritant will probably not be found In this case a temporary way out of the dilemma is a prolonged course of cortisone This must necessarily engender an uneasy feeling because of the dangers inherent in continued use of the hormone Furthermore because it cures nothing relapse *follows discontinuation* The fact remains that one can expect with assurance that cortisone (and corticotropin) will produce a quick and often dramatic remission Protein and calcium balances become positive and fat absorption is greatly improved A miraculous change occurs in *the clinical* manifestations Idiopathic steatorrhea is a serious disease and complete recovery can rarely be achieved by any therapeutic regi

aspect of the disease for the gastroenterologist

Treatment of tropical sprue is very much more satisfactory than is that of idiopathic steatorrhea Recovery is often clinically complete Change in the patient s residence is not necessary Corticosteroid therapy may produce remarkable improvement within a week but it is seldom necessary or desirable to resort to this form of therapy Folic acid is at present the basis of sprue treatment In new cases folic acid cures all symptoms quickly although abnormalities among the absorption tests may not be much improved The small intestinal lesion is anatomically reversible however if treatment is begun early Sprue patients who have been on excellent diets do not respond to folic acid as well as others In the majority of patients however folic acid plus a high quality diet with fat restricted to about 50 gm daily produces fine results

WHIPPLE S DISEASE

Whipple s disease although rare has proved to be of particular biochemical and histopathologic interest as one of the idiopathic quasi steatorrheas Because better understanding of the disease promises to add much to knowledge of polysaccharide metabolism and abdominal granulomatosis it is well worth considering it in a little detail It is a systemic disease characterized mainly by diarrhea secondary to faulty intestinal absorption macrophagocytosis within the lamina propria of the small bowel and granulomatosis of the mesenteric connective tissue and regional lymph nodes Altered lipoid metabolism does not appear as important in its etiology as do disturbances in mucopolysaccharide behavior Its synonyms enteric lipophagic granulomatosis intestinal lipodystrophy and mesenteric chyladenectasis therefore are misnomers Approximately 70 cases have been reported some without an acceptable degree of validity since George H Whipple first delineated the entity in 1907 Some of the British writers have been rather lenient in their interpretation of diagnostic criteria Specific diagnosis necessarily depends on surgical or autopsy findings although clinical suspicion may be strong

This is predominantly a disease of males for reasons unknown and some compilations of acceptable cases list only male patients Almost all diagnoses have first been established when the patients were between the ages of 25 and 60 years Diarrhea and weight loss are frequently the symptoms which cause the patient to seek medical help Abdominal discomfort is a regular feature In about half of the cases a history of recognized melena can be obtained Low grade fever chronic cough hypotension diffuse—not localized—bronzing of the skin nutritional edema polyarthritis glossitis generalized lymphadenopathy and soft abdominal masses are the main clinical features Emaciation develops as time passes Hypocalcemia may lead to periodic tetany Purpura may appear from time to time Although a chronic rheumatic state is common in all of the idiopathic steatorrheas the peculiar polyarthritis of this disease occurs in 80 per cent of the patients This fact plus the not uncommon findings of serositis pericarditis and endocarditis suggests special significance for the joint disease even to the possibility of the presence of a general collagen fault At times the clinical picture suggests a degree of adrenal deficiency

There are certain complicating features which help distinguish Whipple s disease from other steatorrheas At times small bowel obstruction develops and then in addition to relief from obstruction an operation affords the chance for specific histologic diagnosis Anemia ordinarily becomes prominent as the disease progresses It is a typical blood loss anemia being clearly microcytic and hypochromic as opposed to the characteristic macrocytic anemia of sprue About one third of reported cases have died suddenly Acute heart failure or asphyxia has usually been blamed but the possibility of fatal hypokalemia must be raised

The important laboratory findings are per



Fig 122 Small intestine in sprue Five hours after this patient had been given a barium meal the entire amount had collected in this greatly dilated loop of jejunum

absorption does not reach the very low levels sometimes encountered in idiopathic steatorrhea seldom falling below 50 per cent of the ingested amount

In some parts of the world such as Puerto Rico sprue is always accompanied by megaloblastic anemia In others it is not Fundamentally the disease is the same in all areas being primarily a small intestinal fault It is interesting that because of the prominence of the megaloblastic anemia sprue was in some countries a disease of the hematologists until recently thus providing an exceptional amount of recorded information on this

a large amount of gas in the intestines whether or not anatomic changes are demonstrable If there is extensive involvement the oral glucose tolerance curve may be flat Steatorrhea however is rare

Diagnosis of gross small bowel changes in scleroderma depends on the roentgenologic findings Barium suspension moves slowly through affected segments and there may be considerable chronic atony of the bowel There is in addition segmental widening along the proximal jejunum with mural stiffening and absent motility



Fig 123 Enterogenous cyst of jejunum autopsy specimen from neonate Microscopically it was found that the great sausage shaped cyst shared muscularis propria with the adjacent segment of normal jejunum

PRIMARY TUMORS

Primary small intestinal tumors are of greater clinical interest than their relative rarity might suggest because some are associated with syndromes which include disease elsewhere in the body It is usually said that even when the duodenum and papilla of Vater are included only about 5 per cent of gastrointestinal carcinomas are to be found in the small intestine and at that the incidence in the duodenum is considerably greater than the incidence in jejunum and ileum The gastrointestinal sarcomas on the other hand are unique in that about 60 per cent choose the small intestine Unless the lesion whether benign or malignant is one which is associated with a syndrome which includes some externally evident abnormality detection may be very difficult short of surgical exploration and preoperative identification is usually impossible This is a roentgenologically inaccessible organ when it comes to discrete isolated lesions as satisfactory as roentgen study of its diffuse diseases may be

The local effects of small intestinal tumors may be quite similar whatever their type The tube in which they develop is a narrow and mobile one and they frequently make their presence known by causing obstruction It is mobility rather than narrowness which encourages obstruction paradoxically

sistent leukocytosis hypochromic anemia hypoproteinemia hypocalcemia and variable hypokalemia The results of oral and intravenous glucose tolerance tests are entirely similar to those observed in sprue being governed in both cases by faulty intestinal absorption Roentgenographic study of the small bowel characteristically shows the deficiency pattern to which there may be added findings suggestive of regional ileitis It is most important to note that increased stool fat (neutral fat and fatty acids) is found in only half of the cases

If laparotomy has permitted biopsy of small intestine nodes and mesentery a specific histopathologic picture will be found The cytoplasmic foreign material which characterizes the macrophagocytosis within the small bowel s lamina propria is a strongly phagocytotaxic mucopolysaccharide It seems that the macrophages which are mobilized by the presence of this material engulf available fats as well as the glycoprotein in their enthusiasm The intestinal villi are enlarged by extensive infiltration of the lymph spaces and connective tissue with the giant histiocytes Within the mesenteric connective tissue and lymph nodes the same type of macrophagocyte is caught up in a well defined granulomatous reaction

No specific treatment is available From time to time reports suggest that roentgen therapy and nitrogen mustard are helpful Control of the clinical manifestations with cortisone has been reported but as yet experience has been very limited

ILL EFFECTS OF MINERAL OIL

If mineral oil with small amounts of olive oil is fed to experimental animals some of it is absorbed The amount of finely dispersed paraffin emulsion which can be absorbed is as much as that which is absorbed when an olive oil emulsion of similar dispersion is fed to the animals After several months lipogranulomatoses develop in the mesenteric nodes and lipophages and extracellular sudanophilic material accumulate in the lamina propria of the jejunum and proximal colon These are the characteristic morphologic findings of Whipple s disease except that the extraneous material is paraffin hydrocarbon instead of a mucopolysaccharide

Clinical applications of this information are somewhat uncertain The habitual evening dose of mineral oil is probably innocuous except for bowel function even if taken over long periods because the stomach is empty It is probable that mineral oil can not be absorbed unless it is finely emulsified Olive oil emulsifies it effectively and unfortunately some salad dressings are or have been adulterated with mineral oil Although widespread lipogranulomatosis of the mesenteric nodes secondary to long use of adulterated salad dressing must be extremely rare the G node of Bohrod is frequently found at autopsy to be filled with oleophages This is the node of the gallbladder s neck Its oleophages contain paraffin hydrocarbon It is probable that the unconscious ingestion of mineral oil particularly in salad dressing is the explanation G nodes which are altered in this way do not become large enough to obstruct the biliary ducts and appear to have no clinical significance

SCLERODERMA OF THE SMALL INTESTINE

Gastrointestinal involvement in scleroderma is not confined to the esophagus The stomach and any part of the bowel may be affected Most commonly this is the third portion of the duodenum and the proximal jejunum Here the histopathologic changes are entirely similar to those found elsewhere within the connective tissue in this disease There is however no correlation between the severity of the intestinal changes and those of the skin although when there is intestinal involvement the over all course of the disease tends to be rapidly progressive Clinically small bowel involvement does not often make its presence known Distention type pain is the usual complaint There sometimes is diarrhea in spite of delayed transit time It is common upon examination of the patient with scleroderma to find

a large amount of gas in the intestines whether or not anatomic changes are demonstrable If there is extensive involvement the oral glucose tolerance curve may be flat Steatorrhea however is rare

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and it is to be noted that annular constriction and obturation are relatively unusual *behavior patterns for small intestinal tumors* Obstruction instead is usually due to intussusception or volvulus initiated by the mass Bleeding is relatively common but *except in* the case of angiomas torrential hemorrhage is most unusual Perforation is rare

BENIGN TUMORS

Adenomas usually grow as distinctly polypoid tumors Multiplicity is the rule but it is unusual for their number to exceed a dozen They provide an effective trigger for initiation of intussusception and unless they produce obstruction in this manner or unless they should bleed they escape notice Specific diagnosis is impossible prior to laparotomy In addition to being elusive to roentgenologic detection they are difficult for the surgeon to find unless enterotomy is done

Benign connective tissue tumors similarly are likely to pass unnoticed In fact when reviewing the literature on the subject one finds that about 75 per cent of reported cases were found incidentally at operation or autopsy As in other parts of the gastrointestinal tract these tumors tend to enlarge either into the bowel lumen or when subserosal out into the peritoneal cavity The latter of course may encourage volvulus but generally remain subclinical In this position they may attain great sizes and rarely the patient may discover the presence of a mass Leiomyomas seem most likely to produce symptoms either through initiation of intussusception or less commonly ulceration with grossly recognizable bleeding On the other hand about nine out of ten lipomas which make up 10 per cent of this group are stumbled upon by chance

PEUTZ JEGHERS SYNDROME

This syndrome has only recently been publicized but now that attention has been directed to it a great many cases have been recognized from many quarters The two constant features are multiple *polyps of the* small intestine and melanin spots of the oral mucosa (Fig 124) The full syndrome *is believed to be present* in approximately 10 per cent of patients who have *multiple* polyps of the small intestine It tends especially to affect dark skinned Caucasians and the Negroid races There is a prominent familial incidence and it appears to be certain that a simple mendelian dominant factor is at work

The blue brown or black pigment spots are most characteristically found on the buccal surfaces and the hard and soft palates Frequently they develop over the perioral area and vermilion of the lips Less commonly the palms soles and backs of the fingers are affected They are discretely oval circular or irregular spots without elevation and measuring from 2 to 4 mm in diameter They may be present from birth but if they are not they are first noticed by the parents when the patient reaches the fifth or sixth year Apparently they are passed off as moles inciting no particular interest

The polyps are simple adenomas There are ordinarily several scattered through jejunum and ileum In addition there may be polyps in the stomach colon and rectum Infrequently polyps are found also in the nose and bladder There is no melanin in the gastrointestinal lesions Malignant change has been reported in the small intestine of about 20 per cent of cases mostly in the ileum There appears to be a familial tendency too towards malignant transformation of the polyps

Usually the syndrome first makes its presence known through acute intussusception Commonly the patient gives a history of repeated segmental resections of the small intestine because of polyps discovered during operation for intussusception When one finds the characteristic pigment spots on a patient who presents the clinical picture of mechanical bowel obstruction intussusception of the small intestine secondary to polyposis can be considered a likely diagnosis

MALIGNANT TUMORS

Carcinomas of the small bowel are adenocarcinomas The argentaffinomas or carcinoids are best considered in a category by themselves The great majority develop in the *duodenum* *Almost all the rest—which are not many—occur in the first two feet* of jejunum They assume three general forms proliferative ulcerative and very rarely annular The usual manifestations are obstruction bleeding midabdominal pain vomiting and weight loss This is a tumor of middle age and men seem to be about twice as susceptible as women Surgical intervention is rather often necessary for management of obstruction and bleeding but cure can rarely be achieved

The *sarcomas* are more common and they tend to develop further down along the intestine The average age of the patient at the time of diagnosis is about 40 years and men are somewhat more susceptible than women Many histopathologic types have been described including primary Hodgkin s disease but most are either lymphosarcomas or reticulum-cell sarcomas Because vascular tumors of the small intestine like those of the stomach so often show behavior characteristics which are at variance with their histopathologic pictures it is well to consider all as potentially malignant Usual symptoms are midabdominal pain weight loss and vomiting Bleeding is not particularly common Early in the course tumor spread occurs largely by way of the lymphatic system with metastatic involvement mainly of the regional mesenteric nodes and liver but later peritoneal studding is the rule Examination may furnish two diagnostic hints which permit one to suspect lymphosarcoma prior to histopathologic study First this seems to be the only small intestinal tumor which produces an increase in the diameter of the bowel lumen at the site of the lesion and

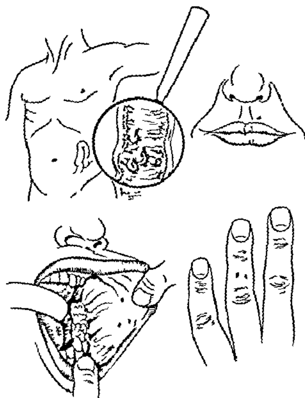


Fig 124 Peutz Jeghers syndrome

this can sometimes be demonstrated upon roentgenologic study Second if pseudo chylous ascites is discovered upon abdominal paracentesis lymphosarcoma may be suspected The fluid appears grossly exactly like that of chylous ascites but microscopically the white opaqueness is found to be due to great numbers of suspended lymphocytes In most cases of small intestinal sarcoma the diagnosis will not be suspected until the abdomen is surgically explored By the time the disease has made itself known extirpation can provide only palliative help in the great majority of cases Radiation therapy and chemotherapeutic agents have much to offer for symptomatic purposes in cases of lymphosarcoma but reticulum cell sarcoma of the small intestine is ordinarily resistant to both

ARGENTAFFINOMAS

The argentaffinomas or carcinoids of the small intestine act as malignant metastasizing tumors in approximately one third of the cases They constitute about 8 per cent of all small bowel tumors Variations in the degree of clinical malignancy are not reflected in the histopathologic picture Metastasis proceeds through the lymphatic channels and most of the spread involves the regional nodes and the liver Occasionally there is peritoneal seeding and metastatic involvement of distant organs

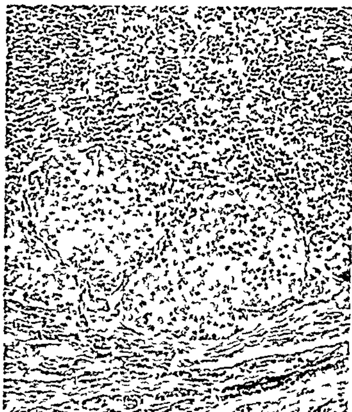


Fig 125 Argentaffinoma of ileum

Most small bowel argentaffinomas develop in the terminal ileum There may be multiple apparently primary tumors Growth begins between the mucosa and the muscularis mucosae (Fig 125) The tumors develop as sharply defined rather small flat firm masses They push the mucosa out of the way rather than invade it and ulceration seldom is produced Encirclement with intestinal constriction rarely occurs If obstruction develops it is usually due to intussusception and this too is unusual

Argentaffinomas in this location occur

principally in men unlike argentaffinomas of the appendix The average age at the time of diagnosis is about 30 years Illness is signalled either by mechanical symptoms or by metastatic growth Often the patient appears to be in much better health than the amount of metastatic tumor would seem to permit The course is unpredictable and sometimes a large mass of tumor suddenly becomes quiescent and remains so for years

Because of the relatively benign behavior of argentaffinomas of the small intestine a good many prove curable by surgical resection They are notably resistant to radiation therapy

SYNDROME OF MALIGNANT SMALL INTESTINAL ARGENTAFFINOMA WITH SYSTEMIC EFFECTS

A most remarkable syndrome of the adult involving metastasizing argentaffinoma of the small intestine has recently been recognized and within a few years cases have been described with surprising frequency In addition to the malignant argentaffinoma the syndrome consists of hepatic metastases valvular disease of the right side of the heart and bizarre vasomotor instability and cyanosis Pulmonary stenosis and tricuspid regurgitation without septal defect are the usual cardiac abnormalities The skin manifestations are most prominent on the face and neck extending to a lesser degree over the trunk and extremities They take the form of rapidly changing cyanotic patches — red islands on a blue sea Early there may be merely paroxysmal flushes from pink to light blue but as time goes on the degree of facial cyanosis during some periods may be most striking If the patient is placed in the knee-chest position as for sigmoidoscopy the face and neck may become blue black with brick red splotches

The basis for the vasomotor phenomena appears to be serotonin (enteramin) which is produced in great amounts by the argentaffinoma Experimentally serotonin produces cutaneous vasomotor effects which are similar to those of the syndrome Some observers believe that the valvular lesions may similarly be attributed to protracted influence of serotonin on the pulmonary circulation

Recognition of the strange skin appearances should raise suspicion of the presence of small intestinal argentaffinoma with hepatic metastases Assay of the urine for serotonin and liver biopsy provide valuable diagnostic assistance

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CHAPTER 11

ILEOCECAL REGION

AND APPENDIX

The region of the ileocecal junction is mechanically and anatomically a rather odd one The natural end to side anastomosis is unique and teleologically this does not seem to be an especially good arrangement for the human being s physiology But here more than in any other part of the gastrointestinal tract atavism reigns and the arrangement must be put up with until progressive evolution does away with the local mechanical faults Meanwhile the diseases which occur in this small area will continue to contribute a good portion of all gastroenterologic problems

In this chapter are discussed the diseases which are unique to the region Some problems of the terminal ileum and of the cecum belong more properly to the small and large bowel proper and are covered under those headings

ILEOCECAL VALVE

The ileocecal (Bauhin s Tulpius Varolius) valve is known to the gastroenterologist almost wholly through its roentgenologic appearances It is an organ of dynamics and variabilities and study of its mere anatomy from surgical and autopsy material gives a false impression of what it is like during life There is a sphincter here plus a flutter type of mechanical valve (Fig 126) Apparently no resistance is presented to flow from ileum to cecum The valve at times can however withstand considerable pressure from the cecal side This is usually true when the cecum is stretched for the valve tends to contract if the cecum is stimulated through the inconstant ileocecal reflex But there are variations from valve to valve and from time to time During barium enema fluoroscopy there is easy reflux into the

ileum in about 20 per cent of people who seem to have normal valves Incompetence of the valve can in disregard for physiology be produced in many more by overdistention of the cecum Quite clearly the valve proves effective during normal bowel activities in preventing material from re entering the *small intestine*

The anatomy of the valve is made compli cated by its variations from person to per son Roentgenologic study must be carried



Fig 126 Normal ileocecal valve as viewed from within the cecum

out with the help of compression because of the largeness of the opacified cecum and this necessarily distorts the structures In perhaps 85 per cent of people the ileum joins the cecum on its posteromedial aspect and in the others its posterior Mobility of the cecum in some people makes this rela tionship variable At the valve there is an abrupt change in the nature of the mucosa from ileal to colonic Normally pouching tissue from the ileal side forms a narrow transverse lip extending into the cecal lumen just above the orifice of the valve and another protrudes just below Crescentic folds join them laterally so that although the orifice assumes the form of a transverse slit the valve itself encircles the stoma The lower lip assumes a more active role in the closure than the upper It is believed that the valve muscle is innervated by fibers from T 9 through L 2 It is probable how ever that the mechanical obstruction pro duced by the flaps is just as important as the sphincteric activity

More important than variations in shape and position of the valve in creating diag nostic confusion is variability in size Most *radiologists believe that the total shadow* produced by the valve should normally mea sure less than 4 cm in diameter the average being about 2 5 cm The amount of com pression used during fluoroscopy controls apparent size to a remarkable degree as does the angle of profile When visualized in direct profile each of the valve s lips is normally no thicker than 5 mm Air contrast study is essential for study of the region and abnormal enlargement cannot properly be diagnosed without it The causes for enlargement are prolapse simple edema mus cular hyperplasia fat infiltration and neo *plasia*

To the clinician disease of the ileocecal valve acts in most obscure ways Clinical syn dromes cannot be made out of abnormalities here Relative rarity and simple unfamiliarity are part of the problem no doubt but in ad dition the diseases often fail to produce any symptoms or signs which help the clinician to judge even the part of the bowel affected In many instances recognition of abnormality here comes as a complete surprise during barium enema fluoroscopy

PROLAPSE AT THE VALVE

The ileocecal valve probably never acts as a point for initiating intussusception al though it is regularly carried along when the ileum intussuscepts into the large bowel Prolapse of the valve on the other hand occurs relatively frequently In about 2 per cent of people who are examined by barium enema x ray the shadow that the valve makes in the cecal lumen is larger than it should be and if there are no signs of irregularity or distortion it is customary to apply the diagnosis of prolapse of the valve The criteria for diagnosis are vague to say the least and revolve largely about the factor

of degree Morphologically an abnormal degree of simple protrusion into the cecum is partly due to sliding of the ileal mucosa and partly to submucosal edema and actual hypertrophy of the valve lips The term prolapse then does not tell the whole story The defect is smooth and clear and if visualization is satisfactory it is seen to have the usual configuration of the valve (Fig 127) There is no associated disease in the region Most patients with this defect are in middle life when it is discovered There is no sex preference

The importance of prolapse lies in the roentgenologic problems it may create by simulating polyps and sessile tumors Examination of the area is difficult enough to cause uncertainty to arise from time to time

Clinically no syndromes or symptoms can be ascribed to the defect with any assurance Cramps bloating and similar nonspecific symptoms were perhaps the reason for the roentgenologic study s having been made and in the absence of other findings there is the usual temptation to place the blame on any demonstrable variation from classical concepts of anatomic normalcy



Fig 127 Prolapse at the ileocecal valve as demonstrated by air contrast study The configuration of the valvular lips is normal but the valve extends more than halfway across the cecal lumen

OTHER LOCAL ABNORMALITIES

In addition to the bowel diseases which may spread to involve the ileocecal valve as discussed elsewhere there are a few processes other than prolapse which may cause deformity of the valve Simple edema of the valve probably occurs fairly frequently although it is possible that prefluoroscopic

preparation with castor oil incites edema and thus gives a false impression of its frequency No clinical implications are known for this simple form of edema and it does not ap pear that angioneurotic edema very often affects this segment

Tumors of the valve are rare Lipomas are most often encountered at least half merely by chance Those that perhaps can be blamed for symptoms are associated with hypogastric aching irritable bowel manifestations gas pains and similar nonspecific symptoms In addition to actual lipoma formation the valve is prone to accumulate fat in the sub mucosa of its lips This is merely adipose areolar tissue It does not cause obstruction or other problems Adenocarcinoma in this location usually calls attention to itself by bleeding rather than obstructing The roent genologic diagnosis may be very difficult unless it is possible to demonstrate clear cut irregularity asymmetry or obvious loss of mucosal pattern Other even rarer tumors are polypoid adenoma argentaffinoma and lymphosarcoma

SPECIFIC REGIONAL INFECTIONS

HISTOPLASMOSIS

The matter of gastrointestinal histoplas mosis is an unsettled one The gastrointes tinal portal of entry for *Histoplasma capsulatum* has been proved possible ex perimentally but the common route of trans mission is probably respiratory Although it has rather suddenly been discovered that histoplasmosis is a common infection clini cally recognizable gastroenterologic illn ss remains rare except as it may appear as part of a late systemic response The gastroin testinal tract is usually found at autopsy to be involved by intestinal ulcers in fatal cases of histoplasmosis as one might expect in any systemic infection however rarely does gastrointestinal localization cause spe cial gastrointestinal problems during the course of the illness The history of histo plasmosis of this organ system has been marked mostly by efforts to identify the organism in biopsy or autopsy material from patients known to have the infection else where

Interest for the gastroenterologist has been stimulated largely by discovery of histoplas mosis in surgically amputated appendices Although additional interest has been aroused by certain poorly identified but suggestive liver granulomas and with an occasional case of apparently specific small and large intestinal polyposis the most fruitful material for clarifying histoplasmosis for the gastro enterologist remains the appendix It has been said that about 10 per cent of noninflamed surgically removed appendices from young people show histopathologic evidence of his toplasmosis There is lymph follicular hyper plasia plus groups of spherical encapsulated organisms from 1 to 6 micra in diameter within the many phagocytes But there are many difficulties in the morphologic tissue identification of the infection Most observers insist on cultural identification and by this technic it is found that histoplasmosis is a very rare disease of the appendix More information is required on these matters Now that controversy has arisen interest will no doubt remain active

TUBERCULOSIS

Secondary tuberculosis of the intestinal tract is encountered in about three quarters of tuberculous patients who come to autopsy In most of these it merely takes the form of localized infection of the ileal lymphoid tis sue which during life did not prove to be of any consequence It is ordinarily not sus pected clinically because so many tuberculous patients have abdominal symptoms whether or not there is gastrointestinal localization Nevertheless when the bowel becomes ex tensively involved it can prove to be one of the most disabling complications of tuber culosis Although primary tuberculosis of the intestine is rare in the United States the pos sibility of bovine exposure should be excluded carefully before the diagnosis of primary tuberculous enteritis is rejected in a suggestive case

Important gastrointestinal tuberculosis is most often an infection of the terminal ileum and cecum It originates in the mucosal lymphoid tissue Initially multiple superficial ulcers form The disease may remain largely ulcerative and in the later stages the ulcers may girdle the bowel Spontaneous fistula formation is a very rare complication During the healing phase fibrosis of all layers of the bowel wall become prominent the result often being multiple areas of heavy cicatricial stenosis At the valve itself the infection characteristically produces prolonged spasm early in the course with deformity and hypermotility of the most terminal ileum Later the area becomes immobile and even rigid as a result of fibrosis Meanwhile the cecum which is rarely involved in the absence of infection of the valve becomes contracted and shortened Finally an enteroperitoneal communication may develop so that the infection is carried by the lymphatics from the bowel wall out to the mesenteric nodes Tuberculous mesenteric adenitis is the source of most of the complications beginning with caseation which sometimes leads to tuberculous peritonitis internal fistulas and external fistulas Characteristically extensive mesenteric and omental adhesions form so that a rather large mass is sometimes formed

The chronic hyperplastic form of tuberculosis is occasionally encountered in the ileum but seems more partial to the cecum In this form a discrete tuberculoma may be the only local evidence of disease

Appendiceal involvement is common when there is ileocecal tuberculosis and it is found upon histopathologic examination of about 0 3 per cent of appendices which are removed surgically Very rarely it is encountered in the apparent absence of infection elsewhere in the body It can be recognized only upon microscopic examination Its discovery almost always comes as a surprise

The most frequent symptom of ileocecal tuberculosis is rather diffuse abdominal pain usually most severe in the right lower quadrant Although anorexia and nausea are common, they are to be expected in all forms of tuberculosis wherever the infection lies The defecation pattern is usually altered Some patients develop persistent diarrhea sometimes with gross hematochezia Others become constipated or there may be alternating diarrhea and constipation Gaseous distention and borborygmi which are localized in the right lower portion of the abdomen are common In about one third of the patients who are under treatment for pulmonary tuberculosis there are no new symptoms referable to the abdomen when the bowel becomes involved but the complication is suspected because the patient fails to gain weight in spite of improvement in the pulmonary infection Physical examination reveals considerable tenderness in the right lower quadrant and sometimes a large mass is found The mass characteristically feels rather soft complex and poorly limited

For detection and identification of tuberculous enteritis roentgenologic study of the bowel is the only useful procedure Although concentration and culture of the stool sometimes permits isolation of the tubercle bacillus this does not by any means prove gastrointestinal involvement The radiologic features are those which would be expected from the pathologic changes areas of constriction and dilatation of the distal small bowel an ulcerated mucosal pattern constriction and shortening of the cecum and excessive irritability and spastic narrowing of the colon (Fig 128) Distortion and irregularity often seem to be randomly arranged but there is some tendency for the narrowings to be cone shaped pointing in the direction of the ileocecal valve The changes proximal to the valve are more likely to be fixed than those observed distally

Treatment is of course directed at the whole infection as outlined for tuberculous peritonitis Streptomycin and para aminosalicylic acid sometimes produce striking improvement in the abdominal symptoms Surgical resection which is attended by imminent hazard of dissemination of the infection and subsequent fistula formation no longer appears to be necessary if medical therapy is



Fig 128 Ileocecal tuberculosis with characteristic roentgen findings Note calcified mesenteric nodes

begun prior to obstruction If it is not ileo ascending colectomy may rarely be necessary

ACTINOMYCOSIS

The usual site of localization for gastro intestinal actinomycosis is the ileocecal re gion A very chronic disease it is character ized by slow formation of a granulomatous mass in the right iliac fossa as a result of in fection of and extension from the appendix cecum and adjacent ascending colon *Nocardia* (*Actinomyces*) *israeli* not uncommonly exists as a saprophyte in the mouth and probably the organisms pass constantly through the gastrointestinal tract Obviously natural re sistance to infection is very high The factors necessary for establishment of infection in the bowel are not known

The pathologic process combines chronic inflammation granulomatous response forma tion of small pockets of pus containing the characteristic sulfur granules and heavy fi brosis There is much local tissue destruction with eventual formation of internal and

external fistulas Intestinal obstruction is unusual in spite of the fact that several segments of the small bowel may become adherent to the mass Locally the peritoneal cavity is obliterated Metastatic multiple liver abscesses are common as a terminal event

Sometimes early in the course the clinical picture of acute appendicitis develops and the diagnosis of actinomycosis is either made by the surgeon who unexpectedly encounters sulfur granules during his exploration or by the pathologist upon examination of the resected appendix More often the local infection causes surprisingly few symptoms and the illness manifests itself more through weight loss mild fever anorexia and the other problems which are common to chronic system disease Appearance of fistulas on the abdominal wall almost always permits easy recovery of sulfur granules which are little actinomycotic colonies and final identification may be made by anaerobic culture The organism cannot be satisfactorily isolated from the stool Upon roentgenologic study of the colon a picture simulating cancer is usually found

Abdominal actinomycosis is almost always a fatal disease Several drugs when used over prolonged periods offer a little help each to about the same degree sulfonamides penicillin Aureomycin and Chloramphenicol Resolution of the mass is not to be expected Surgical management of fistulas is ordinarily most unsatisfactory

CECUM

VOLVULUS

This is not a rare cause of intestinal obstruction particularly among middle aged and elderly people It accounts for about 5 per cent of all fatal cases of obstruction It happens about three times more often in men than in women The predisposing circumstance is failure of normal fixation of the cecum with persistence of a mesentery The degree of mobility so produced is variable and consequently torsion may be only partial or the organ may be able to revolve several times It has been found by autopsy study that a cecal mesentery long enough to permit manual volvulus occurs in about 10 per cent of all adults Usually a length of ileum and a short segment of ascending colon take part in the twist The presence of a cecal tumor or cyst is important in initiating the process Precipitating factors are violent purgation gaseous distention and heavy physical activity Volvulus has been reported many times during pregnancy during labor and following delivery and there seems to be a precipitating circumstance here

Repeated attacks of partial or quickly reducing volvulus may occur before obstruction with strangulation suddenly supervenes At first therefore the patient may not realize the seriousness of an attack which is destined to end in gangrene The first symptom is often pain in the right lower quadrant followed by cramping midabdominal pains and distention The location of pain however is notoriously variable in this condition Quickly all the manifestations of acute strangulated obstruction develop in a few of the patients More often a few hours of only moderate distress follow the first symptoms During this period the patient may move his bowels After the first hour or so a mass can almost always be palpated in the midabdominal region or in the left lower quadrant The obstructed segment is distended by both gas and fluid As time passes the cecum may become tremendously dilated filling half the abdomen often over on the left side Accompanying dilatation of the proximal small intestine masks signs which might permit one to identify the cecum The final stage is gangrene of the wall and perforation

Plain roentgenologic films are at times diagnostic More often they leave uncertainty over the location of the obstructing process If a barium enema examination is made the situation may become clarified Diagnosis depends on identification of the dilated obstructed segment as cecum It may be very large and closely simulate distended stomach or any part of the colon It almost never lies in the normal cecal position

Treatment calls for emergency laparotomy with manual untwisting of the volvulus and retroperitoneal fixation of the cecum Strangulation may necessitate right hemicolectomy Chronic recurrent volvulus is similarly an indication for retroperitoneal fixation of the cecum and ascending colon if need be

CECITIS

Before the clinicopathologic aspects of acute appendicitis were worked out the diagnosis of acute cecitis (typhlitis) was a popular one used to cover most acute inflammations in this general area Now it is recognized that cecitis is very rare but because both acute and chronic forms do exist it is necessary to pause briefly here

Acute cecitis takes the form either of a phlegmonous submucosal infection or of a more superficial necrotizing process The former is characterized by acute and chronic inflammation often with many eosinophils and early fibrosis Primary bacterial infection seems to be at fault The symptoms simulate those of acute appendicitis and discovery of a tender mass in the cecal area usually leads to the diagnosis of appendiceal abscess The nature of the lesion ordinarily is not recognized short of resection and pathologic examination Presumably surgical treatment will already have been carried out by the time the diagnosis is made

Necrotizing cecitis usually occurs as a complication of agranulocytosis It has characteristics similar to those of the necrotizing lesions which may develop elsewhere as a result of this process

Chronic cecitis refers merely to diffuse chronic fibrous replacement of the cecal wall The process is usually encountered in old people and is believed to be secondary to old infection in the region plus some degree of vascular insufficiency Great thickening may develop producing a ligneous shell which can be palpated upon physical examination

ACUTE DIVERTICULITIS

One of the rarest abnormalities to be discovered within the abdomen is an uncomplicated true diverticulum of the cecum Acute diverticulitis is far more common in clinical experience Every cecum produces temporary pouches constantly as a result of its normal muscular relaxations and the relative restraint exerted by its three taeniae In time one of these pouches may become entirely atonic and then a relatively short static cecal protrusion forms In almost all cases such diverticula are single Acute diverticulitis of the cecum is a process which ordinarily affects one of these slowly developing functional diverticula True congenital diverticula may also become involved It is no surprise then to find that the majority of instances are encountered in middle aged people but the disease is by no means unknown in young persons There is no sex preference It is encountered in approximately 0 2 per cent of people who are operated upon for suspected acute appendicitis

The process is a moderately acute or subacute inflammation of obstruction In more than half of the cases there is a fecalith—often quite large—buried in the inflamed wall and fecaliths are believed to be the usual cause of obstruction Because of the large amount of inflammatory tissue which characteristically develops it is difficult to know about other possible obstructing factors A large indurated mass often is formed External appearances may be very similar to those of carcinoma of the cecum The presence of a diverticulum usually is not recognized until sections are made Abscess formation with heavy adhesions are usually found In acute cases there may be local gangrene and perforation The latter may lead to formation of an enterocecal fistula Ileal obstruction is a rare result

Clinically acute diverticulitis of the cecum simulates acute appendicitis closely Unless the appendix has already been removed an accurate preoperative diagnosis is probably never possible The need for surgical inspection of the area becomes clear enough in almost all cases The proper operative procedure depends on the findings Because appearances so often suggest cancer radical resection will

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patients of all ages from 1 year to 75 years or more Most patients are young adults at the time of intussusception A history of recurrent clinical attacks is common and presumably this means that spontaneous reduction readily occurs in some patients

The clinical manifestations may be much like those of acute appendicitis—cramps which tend to be referred to the right lower quadrant nausea vomiting and a variable degree of localized tenderness Hematochezia is unusual A mass is palpable in about half the cases There are no peritoneal signs unless the intussusception becomes compounded In less than half of the cases the cecum and ileocecal valve region eventually join the intussusceptum with progression far up the ascending colon Strangulation may then occur Upon x ray examination the coiled spring effect which is observed within the colon when the small intestine is part of the intussusceptum is not found

Preoperative diagnosis seems to be quite impossible Treatment is surgical and usually is carried out with the preoperative diagnosis of atypical appendicitis Often the attack suddenly subsides spontaneously and plans for definitive therapy must then necessarily await another attack for interim studies fail to reveal abnormality in the region In cases in which intussusception of the appendix has initiated extensive intussusception of the cecum up into the colon reduction is often possible under barium enema fluoroscopy although this maneuver is apt to leave gangrenous bowel behind

ACUTE APPENDICITIS

Acute appendicitis continues to be one of the most important diseases for gastroenterologist general surgeon and pediatrician Approximately 10 to 15 per cent of major operations in the average general hospital are appendectomies During the present era about 2 500 people die of the disease yearly in this country or a mortality rate for acute appendicitis of about 1 3 per 100 000 The mortality rate among patients with acute appendicitis in this country is still about 400 per 100 000 with much higher rates among some big city populations

Acute appendicitis is still a serious problem because it does not always cause the patient to recognize the trouble he is in until late in the course and because it is a difficult disease for the doctor to diagnose during the early stage About 3 per cent of patients still do not seek help until spreading peritonitis has developed The tragedy becomes clearer when one considers that only about 5 per cent of people who die of acute appendicitis do so within the first 36 hours of illness It has become rather trite to point out that only to the junior medical student is the diagnosis of acute appendicitis easy and that the most characteristic feature of the disease is the variability of its clinical manifestations but there can never be too much emphasis on the points that this is an important and difficult disease and that the mortality rate is too high

MECHANISMS AND PATHOLOGY

The appendix does not succumb to infection unless there is stasis of its contents The two main causes for stasis and therefore causes for acute appendicitis are obstruction due to swelling of the submucosal lymphoid tissue and blockage by fecaliths Not much is known about predisposing circumstances and perhaps there are not many important ones In children the incidence of acute appendicitis among different groups and in different localities appears to be related to the frequency of acute infectious diseases About 2 per cent of children and young adults with acute salmonellosis develop acute appendicitis during the course of the infection the most striking example In adults there is some suspicion that abnormally placed appendices are more susceptible to obstruction than others —a concept to which most young surgeons are likely to subscribe At any rate an inordinate proportion of acutely inflamed appendices lie in the retrocecal position Similarly more than might be expected on the basis of chance are found in such unusual positions as within inguinal hernia sacs behind the liver and in the left iliac fossa Preg

be carried out in some cases If the diagnosis is evident local excision suffices

WHIPWORM INFECTION

The adult whipworm *Trichocephalus trichiuris* inhabits the cecum and adjacent ascending colon This aphasmid nematode is cosmopolitan and is very common throughout this country It is a parasite only of man being transmitted in the egg stage by the oral route after the egg which has been shed with the feces has gone through a period of embryonation lasting probably about three weeks From mouth to cecum is a simple journey and after about two months eggs begin to appear in the stool Diagnosis is easily made through concentration of the stool for parasitologic examination and microscopic identification of the eggs (Fig 117)

Whipworm infection rarely is responsible for illness Although the adult worms partly sew themselves into the mucosa they do little damage here and there is little mucosal reaction There is sometimes mild circulating eosinophilia Urticaria has been blamed on the worm In the tropics where whipworm burdens may be very heavy many local and systemic manifestations have been described but it is very doubtful that the blame can often be laid to worms Many of the reported manifestations are clearly due to tropical nutritional problems

There is rarely need to eliminate this well adjusted parasite It is just as well because except for the fresh sap of certain tropical *Ficus* spp no drug is known to be effective for treatment

APPENDIX

The appendix springs from the cecum 2 5 to 3 7 cm below the ileocecal junction where the three taeniae coli meet Congenital absence has been reported but is extremely rare In length the appendix may vary from 1 5 to 25 cm Its usual location and appearance in the abdominal cavity are well known It may point towards or reach any part of the abdomen or pelvis which its length and its mesentery permit Study of usual variations in the location of its tip is not particularly rewarding because this is a mobile organ

The appendix is like a miniature segment of intestine in its general structure and activities Although it appears to have no specific function it has the familiar activities of feeble motility secretion and absorption The main weakness of the human appendix is that it has little muscle and therefore it can empty itself only poorly Relative stasis and easy obstruction are the consequences and these are the qualities which encourage infection The dog for instance has a muscular appendix and never gets appendicitis Following a barium enema a normal human appendix by contrast finds itself unable to empty until from 24 to 48 hours have passed In about 80 per cent of normal appendices there is a sphincter (Gerlach s valve) at their orifice on the cecal wall This tends to keep material out of the appendix but also tends to keep material in

At birth the appendiceal lumen is relatively very large and the wall contains no or only very little lymphoid tissue Very soon lymph follicles develop and by the time of puberty the organ is very rich in lymphoid tissue This change occurs at the expense of the lumen and the lumen becomes narrowest during late childhood and early adulthood Thereafter slow involution of the lymphoid tissue proceeds so that after the age of 50 or 60 years there is little left This is in keeping with the general behavior of lymphoid tissue throughout the body In the elderly person the appendiceal lumen should theoretically once again be relatively large but it is an unusual appendix which has gone this long without developing enough subclinical inflammation to result in narrowing subsequent to fibrosis

INTUSSUSCEPTION

Appendicoappendiceal intussusception with invagination of part of the organ into itself is extremely rare constituting a pathologic curiosity Intussusception of the appendix into the cecum is more common nevertheless few gastroenterologists ever have the chance to observe a case The condition occurs in

patients of all ages from 1 year to 75 years or more Most patients are young adults at the time of intussusception A history of recurrent clinical attacks is common and presumably this means that spontaneous reduction readily occurs in some patients

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nancy should probably be considered a relative *predisposing circumstance Chronic constipation* should not It may be noted that during the era when tuberculosis was treated by pneumoperitoneum a high incidence of acute appendicitis developed among patients so managed The mechanism was not clear

It is probable that acute appendicitis in children is almost always due to the obstruction of lymphoid swelling The organ s lymphoid tissue is a labile one capable of rapid change under various stimuli Reactive lymphoid hyperplasia regularly develops throughout the body in children during acute systemic infections Later on after lymphoid tissue has undergone resolution in its normal fashion the fecalith becomes more important About two thirds of acutely inflamed appendices removed from adults contain fecaliths although not necessarily in such a position *that they might block the lumen* Fecaliths form because the absorptive powers of the appendix are excellent and its emptying ability is poor Unfortunately as they develop only a small proportion of fecaliths become radiopaque If one forms close to the appendiceal stoma secretion may collect behind it and then the conditions are set for distention obstruction of venous return infection and gangrene In some cases careful examination of the appendiceal wall at the site of fecalith lodgment shows that the irritation of its sojourn has led to local inflamma*tion and stricture and that the stricture rather* than the fecalith itself was responsible for obstruction Occasionally a huge appendiceal calculus is discovered by chance in someone who has had no apparent trouble in the region but such calculi probably always start their growth at the end of the lumen

Not rarely pinworms are found in the lumen of an acutely inflamed appendix They are more often found in normal appendices and *there is no reason to* believe they have anything to do with the genesis of appendicitis Ascarids however may effectively plug an appendix and lead to acute inflammation and perforation As frequent as *Endamoeba histolytica* infection may be in the cecum the organism rarely invades the appendix Another ameba *Dientamoeba fragilis* can be found in perhaps 0 5 per cent of surgically amputated appendices but this organism does *not invade tissue and its discovery in this* situation can be considered no more than happenstance

The course of events which follows obstruction of the appendiceal lumen seems to start with distention of the appendage by its own secretions causing interference with venous return and plethora There is consequently an outpouring of exudate into the lumen into the appendiceal wall and out around the exterior of the organ The appendix is made permeable to bacteria by this process Acute infection becomes established within the organ and serosal peritonitis quickly follows A little turbid fluid collects on the ileocecal peritoneum long before perfo*ration occurs Mural gangrene and perfora*tion have both a vascular and inflammatory basis Thrombosed vessels of significant size can be found in as many as one quarter of cases in which the inflammation is still limited to the appendix Perforation spills material rather locally about the cecal region In rare cases there is rupture into the retroperitoneal space

Following perforation a local abscess ordinarily develops *If there is efficient peritoneal* localization it is possible for spontaneous unaided resolution to lead to eventual cure In such cases there are the residual effects of scarring however with cecal deformity and sometimes late intestinal obstruction More often the appendix quickly becomes diffusely necrotic and at operation it may be unrecognizable as such or only part of it may be found When there is this much destruction peritonitis spreads rapidly *The final stage* is generalized fibrinopurulent peritonitis

Hematogenous establishment of infection within the liver as multiple liver abscesses is rare but pylephlebitis probably is not Pylephlebitis sometimes develops after the inflamed appendix has been removed Ordinarily there is spontaneous resolution of complicating vein damage permanent portal vein

obstruction being an unusual sequel of acute appendicitis

THE APPENDICITIS PATIENT

The optimum appendicitis patient is a young adult male He walks into the doctor s office not believing himself to be very sick and not appearing very sick He has new pain in the abdomen and believes something he ate probably caused it From his reading of current newspaper advice or from the advice of parents or friends he knows better than to have taken a laxative because he explains pain in the abdomen often means appendicitis and laxatives as anybody knows are dangerous when there is appendicitis He would like to be checked before the pain lasts much longer

But although lay education has made this great change in the public s attitude towards new abdominal pain and although this happy story is now sometimes encountered it still represents the unusual case There are some features of the appendicitis patient which make it so Appendicitis is a disease of all ages reaching a peak during the 10 post pubertal years Although rare during the first year of life the incidence begins to pick up at the age of 2 years In children especially acute appendicitis often accompanies or immediately follows an acute respiratory infection or gastroenteritis and lingering symptoms may mask the new event The child has no doubt often complained of abdominal symptoms before and the present episode may not be recognized as something new by the mother About 2 per cent of women who develop appendicitis are pregnant at the time with the atypical features that that condition may add to the picture About 1 or 2 per cent of patients are more than 60 years old and most people think of appendicitis only in terms of children and youngsters Finally there is the interesting albeit frightening situation which has led to the familiar quip of the hospital doctors lounge that the most dangerous time for a patient to develop acute appendicitis is when he is a patient in the hospital Few experienced clinicians have escaped the deep distress of finding that one of his hospitalized patients has progressed to late acute appendicitis before the supervention of this new disease was recognized The reasons why this can happen are obvious as is the lesson to be learned

SYMPTOMS

In sizing up the patient and his complaints there is nothing that can be as helpful for the examiner as previous familiarity with the patient and his way of reacting to pain A good part of the diagnostic difficulty in acute appendicitis is created by the variable ways that different people react to the relatively minor early symptoms

If there can be said to be a suggestive or characteristic clinical picture in the young adult patient it takes the form of diffuse epigastric or middle abdominal pain of moderately vague quality which shifts to the right lower quadrant after 24 to 48 hours It may have a sudden onset but ordinarily the whole illness develops slowly over a period of a few hours The shift represents merely the change from visceral to parietal pain It indicates that the peritoneum in the vicinity of the appendix has felt the local reaction not that infection has actually spread to the peritoneum Quite obviously the exact location of the appendix is going to make a difference in the pain s final location but considering the many positions which the appendix may occupy this seems to make less difference than one might anticipate In the great majority of cases the pain ends up in the right lower quadrant even as will be seen in some patients with situs inversus At any rate pain is almost always the first manifestation and unless at the time he is under treatment with analgesics sedatives or steroid hormones it is fair to say that the mentally alert patient with acute appendicitis always has pain prior to rupture of the appendix

It is often said that nausea and vomiting are common symptoms but this does not seem to be true except among children Anorexia however is almost always present Constipation is the rule too except in children

and in patients whose inflamed appendix lies low in the pelvis In fact when diarrhea is associated with abdominal pain in the adult acute appendicitis is an unlikely diagnosis Gas distention is frequently a problem to the patient and this plus the constipation sometimes leads him to observe that it seems as though his digestive tract has stopped working

After the pain has been well localized in the appendiceal area for a variable period of time the patient rather suddenly begins to feel much sicker He must lie down and be quiet The pain becomes more severe He feels feverish Chills appear in about 10 per cent of cases a warning that pylephlebitis may have developed *If the process proceeds to* gangrene the pain often suddenly stops With perforation and spreading peritonitis the symptoms of that complication develop

PHYSICAL FINDINGS

When the patient is examined early his general appearance does not suggest illness His pulse and temperature are normal and remain so for a few hours after the onset of pain Thereafter there is often moderate tachycardia and a little fever

Diagnosis depends entirely on the local *abdominal findings Early tenderness is the* main sign At first the whole area between the umbilicus right pubis and right anterior superior spine may be hypersensitive (Livingston s triangle) After the parieties become irritated the point of tenderness corresponds more closely to the position of the inflamed appendix than does the point of maximum subjective discomfort Usually maximum tenderness is found at McBurney s point which lies one third of the distance from the right anterior superior spine to the umbilicus Although pressure here causes pain under the fingers there may also be epigastric or substernal pain (Aaron s sign) Sometimes it is possible to demonstrate by deep palpation that there is hyperalgesia over the whole abdominal distribution of the right eleventh intercostal nerve Occasionally the region of the left eleventh nerve distribution also is hypersensitive but the area of tenderness depends more on the position of the inflamed appendix than on the fixed distribution of the nerves When there is posteriorly located or retrocecal appendicitis there is relative freedom from intense local tenderness and in cases of pelvic appendicitis examination of McBurney s point is sometimes normal

Rebound tenderness (Blumberg s sign) an important indication of peritoneal irritation is particularly helpful for localizing the site of the appendix and thus for recognizing abnormal position It is however not a specific sign pointing only to local peritonitis not local peritonitis due to appendicitis More secure evidence that the appendix is at fault *is elicited by inducing pain at McBurney s* point by compressing the descending colon or milking it upward (Rovsing s sign) Presumably this leads to slight cecal distention inducing traction on the inflamed appendix The sign when it can be elicited can be considered rather specific for acute appendicitis or other acute pericecal inflammation A refinement of the principle of producing the sign of local pain through distention can be carried out by insufflating air into the colon (Bastedo s sign) but this is a potentially dangerous maneuver

Right rectus muscle spasm is the most important of the wholly objective findings It is in fact the most reliable sign of appendicitis but again it indicates only secondary peritoneal irritation not the source of trouble It is variably present because the inflamed appendix may lie retrocecally or in the pelvis Hard spasm is not often produced the important feature is merely a steady difference in muscle tone between the two rectus muscles For its demonstration only the gentlest pressure should be exerted by the palpating hand and the two sides of the abdomen must be tested simultaneously The difference early in the course is ordinarily a delicate one and the tyro often is skeptical over the importance that the seasoned clinician places upon it But if a difference in *tone* is found even though slight it is of positive clinical significance because except after a

great deal of practice a person cannot voluntarily contact one rectus muscle more than the other

In some cases dermatographism can be demonstrated over the right lower quadrant not over the left (Livingston s red cross sign)

In cases of retrocecal appendicitis the location of the process can often be recognized by eliciting the right iliopsoas muscle sign If the iliopsoas fascia has b come irritated by the local inflammatory reaction pain at the site is felt by the patient when his right thigh is hyperextended or when while lying supine he raises his right knee against restraint If the inflamed appendix overlies the fascia of the right obturator internus muscle it can be located by eliciting the obturator sign of local pain upon rotation of the flexed right thigh inwardly against resistance The value of these two signs is that of localization and they should be sought in every instance of abdominal pain

Search for tenderness by rectal and vaginal palpation is an important part of the examination Sometimes tenderness can be found only by these routes Although this is ordinarily true only when the inflamed appendix extends down into the pelvis it is not uncommon to find that palpation high against the right side of the rectum produces pain at McBurney s point when the process is going on at its usual site (Reder s sign) Vaginal examination is particularly important in making the differentiation from the main simulator of appendicitis in women acute pelvic inflammatory disease

LABORATORY AND ROENTGENOLOGIC STUDIES

These have little to offer in the diagnosis of acute appendicitis There is often a leukocytosis of between 11 000 and 14 000 There is often none and it can be stated categorically that the leukocyte count is a most unreliable sign of appendicitis When the inflammation develops close to the bladder or ureter the urine may contain a few red blood cells When peritonitis extends to the right lateral abdominal wall a plain x ray film of the abdomen shows obliteration of the preperitoneal fat line in the area

SPECIAL MANIFESTATIONS IN THE VERY YOUNG

Acute appendicitis behaves differently in some respects when it affects children Although it has been reported within the first few days of birth it is an unusual disease in children under two years of age Vomiting is often the first manifestation and can be expected at some point during the illness in about 60 per cent of cases In children diarrhea is not uncommon Fever ordinarily appears soon after the first symptoms The leukocytic response is more marked than it is in adults

The course is characteristically rapid In more than half the cases peritonitis has already developed by the time the surgeon reaches the area There is a tendency towards quick perforation sometimes within 24 hours of onset In these cases an acutely ulcerated gangrenous appendix is often found at operation even though the illness seemed very brief Although an intraluminal obstructing element can be demonstrated near the appendiceal orifice in at least 90 per cent of the cases it is perhaps etiologically significant too that only about half of inflamed appendices among very young people are found to lie in the classic position

SPECIAL MANIFESTATIONS IN THE GERIATRICS GROUP

In the elderly patient it is unusual to encounter a clinical picture which is patterned after the classical concept The illness may pass almost unnoticed until perforation Some discomfort is almost always present but it is poorly localized It becomes severe only after peritonitis develops There is no nausea vomiting or tachycardia Rarely is there fever and then it is only slight The localizing signs of tenderness rigidity and pain on rectal palpation are all vague or absent In more than half of the patients the leukocyte count is normal

The appendix in the elderly person tends to be rather atrophic and fibrous and there

may have been degenerative vascular changes before the inflammatory episode supervenes The lymphoid tissue has already all but disappeared A certain inability of the tissues to respond to infection is the result Perforation seems to occur readily

For all these reasons the elderly person with acute peritonitis is often not contacted until peritonitis has developed or the diagnosis is not suspected until rupture has occurred The prognosis in this group therefore is not very good

SPECIAL MANIFESTATIONS IN SITUS INVERSUS

Acute appendicitis is such a common disease that one must expect to encounter it under many strange circumstances and in people already sick with other unrelated processes It may occur among patients who have the diseases which create the main differential diagnostic problems such as sickle cell anemia acute pelvic inflammatory disease and Meckel s diverticulitis It may develop during acute poliomyelitis or complicate a strangulated femoral hernia In general appendicitis must be a part of one s thinking whenever he is dealing with sick people Situs inversus and pregnancy deserve a special word

In situs inversus viscerum totalis the central nervous system almost always escapes reversal The early reference of pain from an acutely inflamed left sided appendix in situs inversus is the same as that of the normally placed appendix—usually the epigastrium or midabdomen At times it may be directed to the right lower quadrant With peritoneal involvement the pain and tenderness are expected to shift to the left side Nevertheless in almost half of the cases which have been discussed in the literature the appendectomy incision was made by error on the right side The experience illustrates that diagnostic difficulties created by this combination of conditions are universal and it would be a bit ostentatious to suggest that there is a certain way to avoid the error It would appear however that when all of the viscera are reversed examination of the heart and liver in addition to the appendiceal region should reveal the fact

SPECIAL MANIFESTATIONS IN PREGNANCY

Acute appendicitis develops in one of about 1500 pregnant women who eventually go to term and as already mentioned about 2 per cent of women who develop appendicitis are pregnant at the time Eighty per cent are in the second trimester of pregnancy when appendicitis develops Most have had previous attacks suggesting mild appendicitis which have cleared spontaneously The diagnostic problems presented are often very difficult and there are no special tricks to solve them The maternal mortality rate is high—20 per cent in some series—and this makes acute appendicitis during pregnancy a particularly dangerous form of the disease If the appendiceal disease can be recognized early there is no reason to think that the prognosis would be worse than it is under other circumstances

There are three features of the clinical picture which are unique The patient no doubt has already had a certain amount of abdominal discomfort from the pregnancy and it is easy for her to overlook the possible significance of new visceral pain Second when parietal pain appears it is usually felt by the patient high in the abdomen above the level of the umbilicus Rather frequently it is distinctly subcostal leading to suspicion of gall bladder disease Third the findings upon palpation are notoriously misleading Local tenderness may never become evident because the enlarged uterus may overlap the area of inflammation If tenderness is demonstrated it usually is found to lie higher and more laterally than it does in classical appendicitis

Surgical treatment ordinarily creates no special problems unless serious renal disease is already present The incision is usually made at the umbilical level

RECURRENT APPENDICITIS

After a notably stormy history the concept of recurrent appendicitis has become firmly established as a clinical and pathologic entity

and a rather common one at that It should not be referred to as chronic appendicitis for which not much of a case can be made Recurrent right lower quadrant abdominal pain in some people is certainly of appendiceal origin It sometimes precedes acute appendicitis and removal of the appendix in such cases often seems to cure Even though clinical evidence of appendicitis is rare in children less than two years of age the appendices of two year olds sometimes show evidence of previous attacks of inflammation and approximately 10 per cent of those removed from young adults show fibrosis This is not a chronic inflammatory process but the inactive residual of recurrent attacks

Apparently the important sequel of recurrent appendicitis is acute appendicitis Approximately one third of the patients with acute appendicitis give a history suggestive of one or more previous attacks The assumption is that recurrent appendicitis merely represents a series of acute inflammatory episodes which are spontaneously handled by local protective mechanisms until one comes along which is accompanied by complete obstruction and interference with the appendiceal blood supply

APPENDICEAL DIVERTICULA

True diverticula of the appendix are extremely rare but false types probably form on about half of appendices which have gone through the cycle of acute inflammation local rupture and spontaneous resolution Because not many patients survive this course of events without surgical help the lesions are uncommon They appear to be for the most part merely short sinus tracts which have become epithelialized There is no muscularis The majority develop at about the middle of the appendix and from the mesenteric border (Fig 129)

The problem with appendiceal diverticula is that they are prone to become infected again Characteristically diverticulitis in this location runs a rapid course Perforation is common in spite of the large amount of old inflammatory tissue which may have developed in the area

TREATMENT

Treatment of course consists of surgical extirpation as soon as the diagnosis is agreed upon The antimicrobial drugs have been one of the important factors in reducing the mortality rate of acute appendicitis but only when used to complement surgical therapy Medical treatment has no place by itself except as interval management while preparations are being made for operation When surgical facilities are unobtainable it can be agreed that antimicrobial treatment alone is preferable to appendectomy performed by an ambitious pharmacist with a soup spoon and fountain pen cap as has been reported

POSTOPERATIVE FISTULAS

An external fistula develops following appendectomy in approximately 2 per cent of cases Fistulas which are due to drains areas of cecal necrosis secondary to vascular thrombosis simple leaks incompletely evacuated abscesses and blown out stumps ordinarily heal spontaneously provided there is no obstruction somewhere along the colon The patient s age and the amount of chronic inflammatory reaction which has developed about the cecum have no doubt an important influence over the time required for this

External fistulas which persist are almost always due to foreign materials A foreign body granulomatous fistula track forms from the cecal area to the skin Talc and sutures are the commonest causes Occasionally metallic mercury from the ruptured bag of a transnasal tube is found seeded through the fistula tract as the incitant for the granulomatous process Various helminths and their eggs especially pinworms and whipworms may become established in a simple fistula and convert it to a granulomatous one Chronic ulcerative lesions develop in the cecal wall and become extremely indolent The fistula tract itself is lined by heavy fibrous tissue enclosing masses of granulomas and broken up by frequent areas of chronic inflammatory

reaction Surgical excision of the tract is necessary for cure

Appendectomy in the presence of cecal amebiasis is fraught with danger because it sis can sometimes be established through identification of *Endamoeba histolytica* in material which drains from the lesion examination of biopsy specimens from the fistula

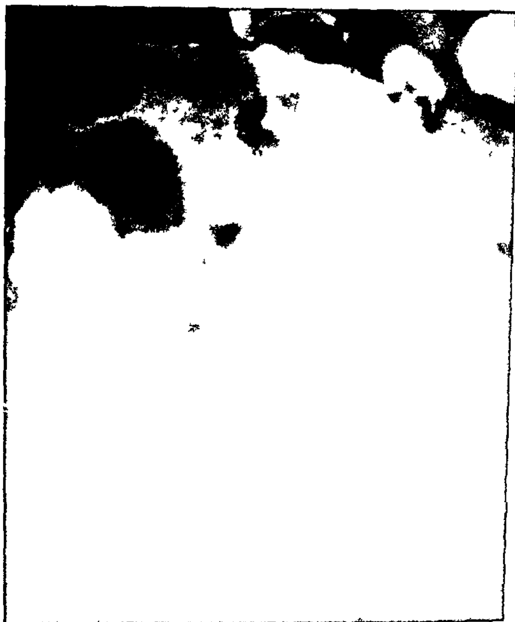


Fig 129 Appendiceal diverticulum believed from the patient s history to be *secondary to spontaneous resolution of acute appendicitis*

is common *for the appendiceal stump to blow* out shortly after operation The result is likely to be free peritonitis or a cutaneous amebic fistula may form This is a persistent fistula *Amebiasis cutis sometimes* develops at the cutaneous end of the fistula Although diagno

wall is more satisfactory Ordinarily in cases of persistent fistula a biopsy will be done without preconceived ideas of the etiology and amebiasis is discovered as a surprise Anti amebic therapy leads to healing in most cases Surgical excision should not be done

BENIGN MUCOCELE OF THE APPENDIX

A mucocele of the appendix is a cystic dilatation due to retention of mucoid material and explained by slow obstruction in the absence of infection It is discovered in about 0 2 per cent of surgically amputated appendices

A rather precise set of circumstances must be present if mucocele rather than acute inflammation is to be the result of appendiceal obstruction and the condition is uncommon because these circumstances do not often occur together The obstruction itself is usually due to a gradually narrowing inflammatory stricture Neoplastic obstruction is sometimes found but it is important to distinguish carefully between the benign type of mucocele under discussion here and malignant mucocele which is the product of mucus secreting colloid carcinoma Active mucus production continues as narrowing progresses This seems important for mechanical lavage of the lumen causing elimination of its bacterial population out through the gradually narrowing appendiceal neck The mucocele contents as well as the wall remain sterile Most important the circulation of the appendix escapes injury The wall shows ability to expand following completion of obstruction sometimes to a great degree The contents have the appearance of cloudy jelly Sometimes there are small globular bodies of condensed mucoid material embedded in the main mass (myxoglobulosis) Histologically the wall may look almost normal or it may be thinned so that the mucosal lining is made up only of a single layer of mucous cells Eventually the mucus sac expands to a point at which the wall consists of no more than a hyalinized membrane Reversion to an inactive state with calcification of the mass may occur if mucus production ceases because of mucosal destruction Perforation may also occur however with spilling of the mucus out through the peritoneal cavity Absence of periappendiceal inflammation often leaves the peritoneal cavity quite accessible Pseudomyxoma peritonaei however does not result because the freed mucus is not self perpetuating There has been some disagreement on this point in the past but it is generally believed now that pseudomyxoma peritonaei of appendiceal origin is always secondary to appendiceal carcinoma

Clinically a young mucocele sometimes presents the picture of early mild appendicitis presumably because of appendiceal distention It is often encountered unexpectedly during operation for suspected appendicitis More often it causes much vaguer abdominal manifestations for several months and then is discovered as a small mass upon abdominal palpation Treatment is simple surgical amputation

TUMORS OF THE APPENDIX

The appendix is relatively free from neoplastic threat There is nothing to suggest that it has any native resistance to tumor formation but rather the explanation seems to be simply that there is not much of it and the statistical chance of neoplasia s striking here is not good The fortunate feature about appendiceal tumors is that they often cause appendiceal obstruction early drawing attention to themselves through the happy circumstance of acute appendicitis

ADENOMAS

Benign adenomas of the appendiceal mucosa are very rare Most instances are encountered in young adults The majority come to light because they have been responsible for obstruction of the appendix and consequent acute appendicitis They have been described in people with multiple polyposis of the colon but they must be considered rare in that condition Adenomas are small polypoid usually single and usually attached at the middle of the organ It is believed that they are precancerous and dangerously so Several cases have been reported in which there have been histologic foci of carcinomatous change without invasion of the stalk thereby meeting the criteria for carcinoma

in situ Intussusception of the appendix has *been ascribed to adenoma*

NEUROMAS

During a long series of efforts to find out why an appendix which superficially appears normal seems able to produce the symptoms of appendicitis, it has been found that tiny intramural neuromas can be found by detailed *histopathologic examination in* as many as *one third of* such cases Sometimes multiple submacroscopic neuromas are present Their clinical significance has not been clarified but the possibility that a clinical entity is implied must be considered Appendiceal neuromas may be plexiform neuromas which arise from the periglandular nerve plexi or *rarely ganglioneuromas which develop from* one of the two major deep plexi

ARGENTAFFINOMA

Argentaffinoma (carcinoid) is the commonest tumor of the appendix accounting for about 85 per cent of all cases and being found in approximately 0 2 per cent of surgically amputated appendices Similarly the appendix is the most common site for argentaffinoma development The argentaffin cells *of Kultschitzky from which the tumor* springs are most abundant in the appendix numerous in the small intestine few in the colon and uncommon in the stomach and the incidence of argentaffinomas roughly parallels this distribution Throughout the gastrointestinal tract the differentiation of malignant from benign argentaffinomas depends on how they act not on how they appear under the microscope Those of the appendix are notably benign and it is sometimes said that they have never been known to prove fatal When argentaffinoma acts as a malignant tumor the small intestine is likely to be the primary site

The majority of these tumors remain entirely asymptomatic and are discovered by chance upon examination of *surgical* or autopsy material The usual age range at time of diagnosis therefore means little but it is found that two thirds of the patients are women Because most of the tumors develop at the tip of the organ occur singly and remain small they rarely cause obstruction and acute appendicitis Growth is limited to a diameter of about 2 cm They remain in the intramural position rarely leading to ulceration of the *overlying mucosa Upon* section a solid yellow homogeneous mass is *found*

Although almost always benign in their actions argentaffinomas of the appendix tend to grow invasively within the *organ and* invasion of the serosa is common (Fig 130) Sometimes there is extension into the appendiceal mesentery Although in about 5 per cent of cases there is spread to the regional lymph nodes nearby organs are not *molested*

Treatment by surgical extirpation has almost always been carried out by the time the tumor is identified or even discovered It may be noted parenthetically that argentaffinomas are highly radioresistant

CARCINOMA

Primary carcinoma of the appendix is rare Technically argentaffinoma belongs under this heading but clinically it cannot be so *considered This leaves two types* adenocarcinoma with characteristics similar to that of carcinoma of the colon and colloid or mucus producing carcinoma which is associated *with* malignant mucocele of the appendix The two types are quite distinct morphologically and clinically Carcinoma of the appendix shows no sex preference It has been diagnosed at all ages from young adulthood through old age

Primary adenocarcinoma which has apparently never been diagnosed prior to surgical exploration usually develops at the base of the appendix and therefore frequently causes obstruction It is not a surprise then to find that about half of the cases which are responsible for illness are discovered at op*eration for acute appendicitis* (Fig 131) Perforation of the obstructed appendix brings about one quarter of the patients to the doctor *Para appendiceal abscess has been re*



Fig 130 Argentaffinoma of appendix The invasive nature of the growth is evident but in the appendix these tumors almost always behave benignly

ported several times and intussusception can develop In addition to an obstructing fungating mass the tumor may assume an ulcerated form and serious bleeding may result A surprising number of the reported cases have been discovered by chance during laparotomy upon other parts of the abdomen

Adenocarcinoma may develop at any point along the appendix with preference for the base It may grow out into the cecal and ileal walls although primary carcinoma of the cecum does not reciprocate by growing down into the appendix Ordinarily a rather low degree of malignancy is demonstrated (Fig 132) The regional nodes may arrest spread for a long time If the cancer goes beyond often it stops again at the liver Metastasis to the ovary has been reported a few times but widespread metastasis appears to be very rare

Treatment ideally involves right hemicolectomy with node dissection but often the diagnosis is not made until after the appendix has been simply amputated and submitted to histopathologic examination Whether then it will be desirable to go back and carry out a radical resection will depend on the surgeon s impressions of the findings at the first operation

Colloid carcinoma similarly may arise at any point along the appendix This is a pearly cystic and gelatinous cancer sparse in cells



Fig 131 Primary adenocarcinoma of the appendix as it was discovered at operation The clinical diagnosis was acute appendicitis and this in truth was present

The grade of malignancy is very low The production of mucus may be tremendously active leading to the formation of a malig nant mucocele Both extension through the appendiceal wall and rupture of the tumor may occur and the common clinical mani festation is development of pseudomyxoma the case The confusion arises from the fact that mucus producing metastases which be come seeded throughout the peritoneal cavity contain few cells and are therefore often difficult to identify Spread from colloid car cinoma is in fact limited largely to peri toneal implantation Although discrete mucus



Fig 132 Early adenocarcinoma (upper left segment of mu cosa) demonstrating the usual low grade of malignancy This tumor was discovered unexpectedly upon routine examination of a surgical specimen It had not caused obstruction

peritonaei or jelly belly Pseudomyxoma peritonaei of the male is almost always due to colloid carcinoma of the appendix Ovarian carcinoma is a more common source in women There has long been argument over whether in the present disease the peritoneal mucus is the result of the neoplasm itself or of merely the appendiceal mucocele which the neoplasm produces The former seems to be filled cysts may develop usually single or groups of very few cells become scattered about and then release their mucus freely into the abdominal cavity Distant lymphatic and hematogenous metastases do not occur

Unless colloid carcinoma should be dis covered prior to peritoneal spread it cannot be satisfactorily treated

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CHAPTER 12

COLON

INTRODUCTION

The colon is an organ of great reflex activity manifesting susceptibility to many types of extrinsic and intrinsic stimuli through muscular excitability variable pain responses and vasospastic phenomena The familiar types of gastrointestinal neuromuscular dysrhythmias are exaggerated in the colon and it is for this reason that the organ seems to receive the brunt of emotional stimuli which are directed at the system as a whole

The ascending and descending portions of the colon are largely retroperitoneal as is part of the rectum The transverse and sigmoid colons have mesenteries and under the influence of posture and contained gas and feces they are capable of long excursions through the abdomen As fixed as the retroperitoneal portions may be in their beds however they are capable of great elongation under the influence of progressive filling as with contrast medium during fluoroscopy The adult colon is said to average about 150 cm in length but it is hard to find a way to express the dimensions of such a contractile organ The lumen during physiologic activities tends to get progressively smaller from cecum to rectosigmoid junction The longitudinal musculature of the colon down to some point on the descending portion is gathered into three longitudinal bands the taenias and these are largely responsible for formation of the haustrations which are so characteristic of the roentgenologic picture The longitudinal muscle of the sigmoid spreads out as a rather uniform layer and here haustrations are not found Much more important than the anatomic differences from segment to segment along the colon are the physiologic differences consequent to progressive dehydration of the fecal stream and to the alteration in propulsive motility this necessi

tates It is not known that these differences exert any influence over susceptibility to disease but it is possibly significant that the majority of colonic lesions occur on the left side of the organ

The sphincters claimed for the colon (Fig 133) appear to be more numerous than

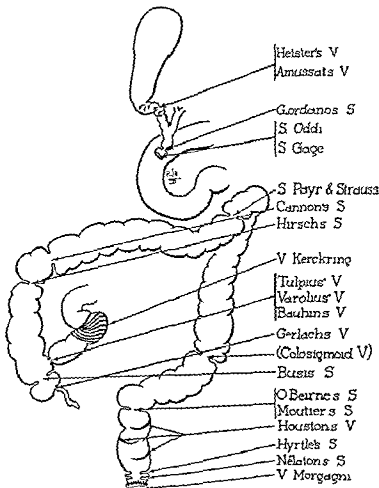


Fig 133 The eponymic valves and sphincters claimed for the gastrointestinal tract

physiologically useful The rectosigmoid (O Beirne s Moutier s) sphincter is a very active one as every sigmoidoscopist knows and it is obviously very effectual in its function of keeping feces within the sigmoid until just before defecation Knowledge of the others is important even though they appear to have no function because they are capable of producing defects simulating disease during roentgenologic examination of the colon

The innervation of the colon is not at all clear Both autonomic and spinal nerves make connections with the organ It is probable that the vagus nerves have no influence on the colon In general most autonomic effects are inhibitory although this cannot be well demonstrated after surgical attempts at denervation The autonomic nerves seem to be optimally stimulated by stress or emotional factors particularly anticipation fear pain shock and postoperative states When the colon is hyperactive muscularly its secretion of mucus becomes hyperactive too probably as a result of a common stimulus Capillary blood flow within the mucosa is similarly in

fluenced by emotional factors and the rela tive speed with which the mucosa can undergo blanching and hyperemia suggests that the process is mediated through the colon s arter iovenous shunt system

THE NORMAL STOOL

The normal average daily fecal output for adults in the United States is about 150 gm In the Orient it is about twice as much and among Arctic populations it is very much less The relative proportion of vegetable foods and meats account for much of the difference and in addition in some populations the normal stool is formed and in others almost liquid Whatever the consistency, the specific gravity is close to 1 000

In the normal adult with ideal bowel habits there is a regular cycle in the amount of fecal output and this averages about two weeks long It may be sufficiently marked to lead to absence of bowel movement for a day or two at the ebb of the cycle but ordinarily it goes undetected unless the daily fecal out put is specifically measured But in most normal people bowel habits are characterized by some degree of unpredictable irregularity This is for the most part natural or normal but if a person does not view it this way he is likely to upset the control further by tak ing laxatives It is difficult for most people to understand that every colon has its own normal pattern of functioning and of re acting to various changes in extrinsic and intrinsic influences and the reason is usually found in their early training to the effect that precise bowel regularity is a prerequisite to health All of this becomes of primary im portance when the patient is questioned about a change in bowel habits As important as it is to find out about this the significance of the patient s answer may be very difficult to determine because of physiologic variations in defecatory periodicity

The constituents of the normal stool as they are measured chemically are well known and require no special comment Bacterially altered bilirubin is responsible for the color and protein breakdown products especially indole and skatole for the odor Not more than 10 per cent and usually less than 5 per cent of the amount of fat ingested is lost in the stool and a portion of this is endogenous On a normal diet a normal adult loses no more than 2 gm of nitrogen in the stool daily partly accounted for by the bacterial content A stool from a normal adult contains no significant concentration of enzymes al though simple diarrhea may cause some par ticularly trypsin to escape before inactiva tion

The fecal bacterial flora is a changing one varying for no apparent reason under static conditions as well as in response to changes in diet climate geographic location and gas trointestinal transit time The changes are re flected to a prominent degree in periodic al terations in stool consistency odor and gas forming propensities Approximately one third of the bulk of the normal stool is composed of bacteria most of which are nonviable In any situation in which bacterial growth is this heavy it is the rule that there is con stant struggle for biologic supremacy With a little environmental encouragement one type takes over for a while suppressing growth of other types until conditions again change The classes which seem to do best in the normal colon are the coliform bacilli enterococci staphylococci anaerobic spore formers bacteroides species lactobacillus species many yeast types and oral spirochetes In former times the clinician used to read much clinical importance into the relative proportions of gram positive and gram nega tive bacteria in the stool classifying bowel disturbances as fermentative putrefactive etc in part according to this criterion Be cause of periodic spontaneous fluctuations in the flora this did not furnish information use ful in understanding the bowel

Particulate matter which is not of floral origin is unusual in the normal stool Grossly only vegetable husks are found Microscopi cally the stool is found to be composed al most entirely of bacteria yeasts the cellu lose remains of plant cells and a few crystals of several types Occasionally one may find a

desquamated epithelial cell or two and a starch granule If mineral oil a salad dressing containing mineral oil barium sulfate or an insoluble bismuth compound has been used the remnants will be found

COPROLOGIC TECHNICS

A good portion of the stool examination is the responsibility of the clinician who is taking care of the patient Depending on his interests he may wish to do all of it himself but many time consuming technics are involved in a comprehensive stool examination and ordinarily most coprologic technics must be left to laboratory helpers Observation of gross stool characteristics microscopic examination and tests for occult blood are best managed by the clinician either because he is best able to do so or because he needs the results sooner than his laboratory could furnish them Microscopic examination of material removed at sigmoidoscopic examination is expeditiously carried out by the clinician on the spot The characteristic findings under various clinical circumstances have been discussed whenever possible in connection with the individual diseases but some generalities must be made here

It is axiomatic that the most generally valuable part of the stool examination is simple inspection of the specimen Form consistency presence of blood general color grossly recognizable foreign objects such as worms presence of bubbles and to a lesser degree quantity are important points The time of day that the specimen was passed should be considered For example diarrhea which is predominantly nocturnal is a reliable tip off of diabetes Diarrheic is a term which merely refers to a loose stool Dysenteric means a bloody mucoid diarrheic stool and the term must be used in no other way Similarly melena means merely the passage of a dark stool while hematochezia is the only proper term for the condition in which red blood is found in the stool

Stool markers are used during certain studies to indicate the portions of the feces which mark the beginning and end of a period of ingestion and to study gastrointestinal transit time One way to mark the residue from a certain meal is to include a capsule of about half a gram of carmine Glass beads can give a rough indication of the quantitative distribution of a meal s residue through successive stools Because of the dispersal of constituents from one meal the marking substance may be passed over a period of three or more days The technic is not useful for metabolic studies because of this dispersal

To obtain a comprehensive picture of the colonic bacterial flora requires extensive laboratory manipulation with smears stained variously culture media of many different types and selectivity and meticulous chemical and typing tests This is a highly specialized technical matter wholly impracticable for anything other than research purposes The well known screening cultural short-cuts however although crude permit the bacteriologist to isolate and then to identify pathogenic bacterial types as well as the viable predominating organisms with sufficient alacrity to render the information useful to the clinician The means and a portion of the interpretation must be left to one s laboratory colleague When detailed or specialized bacteriologic technics such as specific typing are found to be necessary state and other public laboratories are available for help

Direct microscopic examination of feces and rectal discharges for study of cellular exudate and of evidences of parasitism is a technic that the gastroenterologist should carry out himself during examination of selected patients A well worn microscope in or near the sigmoidoscopy room comes close to proving excellence in lower bowel practice Accurate identification of microscopic objects found in abnormal stools requires skill that comes only from practice under competent aegis it cannot be learned from a book A prominent amebologist said less than 20 years ago that, in spite of the plethora of scriptive advice and printed illustration there were probably less than 100 people in the United States who were competent to

make an accurate identification of *Endamoeba histolytica* With more emphasis on clinical pathology in the medical curriculum since World War II this situation should be better now

For the direct wet smear either from a stool or from trans sigmoidoscopic scrapings only enough material should be dispersed in a little water on the slide to make news paper print a little difficult to read through the preparation A cover slip is necessary The preparation should be made and examined as quickly as possible after the material has been passed and use of a warm stage is desirable Stains should not be used until after an initial examination has been made because they halt the motility of nonencysted protozoa Usually there is no need for them then because they do not aid identification of the objects which this type of preparation is primarily intended to show The direct wet smear is used for detection and rough quantitation of pus cells mucous cells un digested meat fat globules Charcot Leyden crystals and other crystals and for identifica tion of protozoa which are not encysted Cysts and worm eggs are noted

A stool concentration technic is required for parasitologic diagnosis This applies to liquid as well as formed stools although it is to be noted that the protozoa which are found in liquid stools are not encysted and are destroyed by concentration maneuvers The technic is intended to make protozoan cysts and worm eggs available in large num bers to the microscopist so their presence may be detected and their species identified Protozoan trophozoites cannot be concen trated except by culture technics Ordinarily one can assume that competent examination of three random stool specimens by direct smear and concentration will reveal any extant gastrointestinal parasitism which is charac terized by passage of eggs or protozoa in 90 per cent of patients It must be remem bered that some tapeworms ordinarily shed proglottids which only release their eggs after having been passed and that pinworms do not usually oviposit within the bowel Although special purgation and enema tech nics for the collection of specimens will in an occasional patient reveal an otherwise undetected amebic infection this will obscure the infection in more Specimens which are to be examined by concentration whether liquid or formed can be stored several days under refrigeration before being studied if need be without compromising the results

There are many efficient technics for con centrating the cysts and eggs in a stool The zinc sulfate centrifugal flotation technic is the best for clinical work For this about 2 gm of feces are suspended in about 10 ml of water washed in water about three times by centrifugalization and resuspension and then suspended in aqueous zinc sulfate solution of a specific gravity of 1 180 and levitated by centrifugalization The cysts and eggs become well concentrated in the sur face film The film is looped onto a slide stained with an iodine stain such as D Antoni s and examined microscopically

When stool examinations for parasites are to be included as part of a large scale routine physical examination and a great many speci mens will be received all at once it is most feasible to make permanent iron hematoxylin direct smear preparations to be examined at one s leisure later on Although the ad vantage of concentration is lost there is much to be gained by slow deliberate study of the stained preparations

SIGMOIDOSCOPY

It goes without saying that peranal en doscopic examination comes close to being a routine means of examining every patient with gastrointestinal complaints It is a rare patient whose general condition does not permit the manipulation or who has such acute disease elsewhere that sigmoidoscopy might prove dangerous Peranal endoscopy is so simple so easy so quick so safe and so revealing that one cannot afford to over look the opportunity to make it as routine as a look inside the patient s mouth A digital rectal examination will be done any way and there is little to the switch from

finger to hollow tube As a rather convincing argument it may be permissible to reiterate the commonly quoted fact that 75 per cent of all lower bowel cancers can be reached with the sigmoidoscope

Sigmoidoscopy like so many medical procedures suffers and even loses its usefulness when it is made into a big production This means difficult and lengthy preparation of the patient scheduling the procedure in a hospital operating room an extra appointment for the patient a change to operating room clothes for the doctor etc If one feels that all this is necessary for sigmoidoscopy he will not do enough examinations It is fortunate indeed that effective routine sigmoidoscopy requires very little time and effort in addition to that required for the remainder of the physical examination

The patient is best examined without preparation of the bowel This is mainly because the appearance of and availability for microscopic examination of surface exudate are so important for diagnosis In addition omission of preparation makes every patient available for sigmoidoscopy at any moment that is convenient besides sparing him some discomfort and inconvenience In most or many cases the endoscopic field is more satisfactory than it is following cleansing The enemas or purgation often recommended for pre examination preparation cause a degree of mucosal hyperemia and sometimes some edema In about one third of the patients the presence of feces precludes complete visualization In many cases small scybala can easily be removed in toto soft material may be wiped away and fluid feces may be aspirated If this is not enough the patient may be sent to the bathroom to move his bowels after a small amount of water has been poured through the sigmoidoscope into his rectum If for some reason the examination is then not satisfactory because of retained material it will be necessary to give one or two formal enemas If enemas are to be used they should be given about an hour prior to the examination

Except for the most unusual patient with difficult personality or emotional problems pre examination medication is neither necessary nor desirable When anal fissure or other painful anal lesion is present a small swab saturated with pontocaine or other surface anesthetic in aqueous solution should be inserted into the anal canal about 15 minutes before examination

There is no better posture for the patient during the examination than a modified knee chest position on a plain flat surface The ordinary examining table is ideal and the patient's bed serves just as well The left arm is folded against his chest and he rests on his left shoulder and left side of his head The knees should be directly below the buttocks The back and abdominal wall must sag throughout the examination When the patient is too weak to support himself it is best to use the left Sims position although this is not nearly so satisfactory Infants and small children are best examined while being held in the arms of a nurse in the prone position with the thighs forcibly flexed

There are many types and designs of instruments available It is difficult to see the advantages of many of these and the simplest and cheapest of standard models seem also to be most satisfactory It makes little difference whether the sigmoidoscope's lamp is proximally or distally situated It is convenient to use a simple ophthalmoscope battery handle for the source of current In addition to a table one needs a 6 5 by 1 8 cm standard anoscope 25 by 1 8 cm standard sigmoidoscope lubricating jelly a little spoon shaped mucosal scraper or aspirating pipettes biopsy forceps and cotton swabs One may wish to have cautery equipment snares probes suction pump and other equipment although these ordinarily are viewed as the accouterments of the surgical proctologist rather than of the gastroenterologist The adult sigmoidoscope is used for children more than one year old A glance at the caliber of a normal baby's stool shows why it is not necessary to lose the advantage of standard sigmoidoscopic diameter in examining young children For infants how

make an accurate identification of *Endamoeba histolytica* With more emphasis on clinical pathology in the medical curriculum since World War II this situation should be better now

For the direct wet smear either from a stool or from trans sigmoidoscopic scrapings only enough material should be dispersed in a little water on the slide to make news paper print a little difficult to read through the preparation A cover slip is necessary The preparation should be made and examined as quickly as possible after the material has been passed and use of a warm stage is desirable *Stains should not be used until* after an initial examination has been made because they halt the motility of nonencysted protozoa Usually there is no need for them then because they do not aid identification of the objects which this type of preparation is primarily intended to show The direct wet smear is used for detection and rough quantitation of pus cells mucous cells un digested meat fat globules Charcot Leyden crystals and other crystals and for identifica tion of protozoa which are not encysted Cysts and worm eggs are noted

A stool concentration technic is required for parasitologic diagnosis This applies to liquid as well as formed stools although it is to be noted that the protozoa which are found in liquid stools are not encysted and are destroyed by concentration maneuvers The technic is intended to make protozoan cysts and worm eggs available in large num bers to the microscopist so their presence may be detected and their species identified Protozoan trophozoites cannot be concen trated except by culture technics Ordinarily one can assume that competent examination of three *random stool specimens* by direct smear and concentration will reveal any extant gastrointestinal parasitism which is charac terized by passage of eggs or protozoa in 90 per cent of patients It must be remem bered that some tapeworms ordinarily shed proglottids which only release their eggs after having been passed and that pinworms do not usually oviposit within the bowel Although special purgation and enema tech nics for the collection of specimens will in an occasional patient reveal an otherwise undetected amebic infection this will obscure the infection in more Specimens which are to be examined by concentration whether liquid or formed can be stored several days under refrigeration before being studied if need be without compromising the results

There are many efficient technics for con centrating the cysts and eggs in a stool The zinc sulfate centrifugal flotation technic is the best for clinical work For this about 2 gm of feces are suspended in about 10 ml *of water* washed *in water about three* times by centrifugalization and resuspension and then suspended in aqueous zinc sulfate solution of a specific gravity of 1 180 and levitated by centrifugalization The cysts and eggs become well concentrated in the sur face film The film is looped onto a slide stained with an iodine stain such as D Antoni s and examined microscopically

When stool examinations for parasites are to be included as part of a large scale routine physical examination and a great many speci mens will be received all at once it is most feasible to make permanent *iron hematoxylin* direct smear preparations to be examined at one s leisure later on Although the ad vantage of concentration is lost there is much to be gained by slow deliberate study of the stained preparations

SIGMOIDOSCOPY

It goes without saying that peranal en doscopic examination comes close to being a routine means of examining every *patient* with gastrointestinal complaints It is a rare patient whose general condition does not permit the manipulation or who has such acute disease elsewhere that sigmoidoscopy might prove dangerous Peranal endoscopy is so simple so easy so quick so safe and so revealing that one cannot afford to over look the opportunity to make it as routine as a look inside the patient s mouth A *digital rectal examination will be done* any way and there is little to the switch from

may sometimes be following removal of only a tiny bit of even normal rectal mucosa This is nevertheless an unusual complication and should not deter one from taking a biopsy when the indications are clear It is a good plan after taking a biopsy from an outpatient to leave a short rectal wick of gauze protruding from the anus to be pulled out and inspected for blood saturation two hours following the procedure prior to the patient s release Bleeding may be delayed for several hours in some cases and the patient should be appraised of the possibility

There is a slight hazard of explosion during electrocauterization through the sigmoidoscope

HAZARDS OF ENEMAS

It is certain that a large proportion of modern people in all parts of the world make frequent use of the enema as have people during every period of recorded history This is such a private matter that it is not possible to obtain specific figures but the gastroenterologist cannot help but be impressed by the ubiquity of the enema habit The enema is probably the most drastic or major of the medical procedures that people are supposed to carry out routinely on themselves Under certain circumstances enemas are of prime therapeutic importance and under others they create difficult physiologic problems The actual physical hazards of an enema are serious enough to warrant constant attention to proper instruction in technic both for professional personnel and for patients who are to administer their own

Most enema accidents are due to injury of the anterior rectal wall during insertion of the tube or nozzle Perforation of the bowel during enema irrigation of colostomies is a very rare accident There are three reasons for rectal injury few people have a correct notion of the direction in which the rectum runs hard tips are sometimes supplied with enema equipment and many people believe that the higher the tube is inserted the more effective the procedure will be A soft rubber tip should always be used and there is nothing but trouble to be gained by passing it beyond the anal sphincter If the tip penetrates the rectal wall a large amount of enema fluid may be deposited in the pararectal tissues before it is recognized that an accident has occurred because a certain amount of discomfort is expected during the procedure The result is catastrophic The fluid quickly dissects widely through the tissues It causes more than mechanical injury by virtue of the fact that it usually is either a hypertonic solution of complex salts or contains some substance which is irritating to the tissues such as soap The patient who at first feels severe pain in the pelvis and lower abdomen may quickly pass into profound shock Treatment demands carefully regulated support for shock and any major electrolyte imbalances that one guesses may have occurred if the composition of the enema fluid is known Unfortunately some people have the pernicious habit of using very high concentrations of patented salts for enemas and the specific nature of the poisoning cannot be determined There is usually little chance to evacuate much of the fluid by emergency surgical incision although experience has been varied in this connection

Perforation of the sigmoid above the point reached by the enema tip rarely occurs unless the area is already injured or diseased It has been reported several times during barium enema x ray examination which has followed sigmoidoscopy In this case the barium suspension often collects immediately as a linear streak between the left lateral abdominal wall and the descending and sigmoid colon (Isaacs sign) Unless the circumstances are most unusual as when a person takes an enema directly from a water tap the amount and pressure of the instillation do not seem to influence the possibility of rupture of the normal colon On rare occasions however sudden effort on the patient s part following administration of the fluid may cause spontaneous rupture

During instillation of oil enemas some oil

ever a narrow instrument is necessary, as it is for examining adults who have an anal or rectal stricture Usually a narrow instru ment must also be used for examining the bowel through an ileostomy or colostomy stoma although there is much to be gained if the standard sigmoidoscope will fit without tension

There are four phases to the examination External inspection of the anus is of course important in itself but in addition the clinician seldom is presented with as good a chance to examine the posterior aspect of the scrotum the large area of skin presented the region of pilonidal cyst formation the amount of ischiorectal fat etc Digital ex amination of anal canal lower rectum and palpable nearby structures is the second step *Anoscopic examination the third is very* difficult for the beginner and it is a long time before he is able to make accurate in terpretation within the anal canal and at *the pectinate line Sigmoidoscopy is the final* phase In addition to inspection of rectum and sigmoid to 25 cm there are biopsy specimens to be taken from localized and sometimes generalized disease processes and mucosal scrapings or aspirations to be ob tained for immediate microscopic examina tion when exudate is encountered

The technic of sigmoidoscopy is very simple but certain principles must be ob *served if examinations are to be fruitful* The object is not to see how far the instru ment can be inserted but to inspect carefully every bit of the mucosal surface within reach of the instrument It is disturbing to watch the student spend all his efforts on the prob lem of inserting the instrument and it is *frightening to find in one s own practice how* often he has missed important lesions As soon as the end of the sigmoidoscope has passed the anal canal the obturator must be removed There are no maneuvers to sigmoidoscopy except that of following the lumen by direct vision wherever it may lead One can always be sure there is a lumen although sometimes it may be difficult to keep faith in the fact The rectal ampulla is surprisingly large and considerable effort must ordinarily be expended to visualize all of its posterior inferior surface The region ahead of each valve of Houston can be ex amined only after the valve has been de pressed and pulled backward with the sig moidoscope When the patient is in the position described above and the sigmoido-scope has opened the anal canal a rather large amount of air moves into the bowel and ordinarily produces good natural dila tation as far as the rectosigmoid junction Beyond this sphincter ingress of air again often opens the lumen rather well Insufflation of air during sigmoidoscopy is never neces sary for a good examination and it is recommended that it not routinely be used Blowing up the bowel is responsible for most of the discomfort which patients feel during insufflation sigmoidoscopy and it is directly responsible for most accidents which occur during the procedure

Sigmoidoscopy is a remarkably innocuous procedure and many or perhaps most ex perienced gastroenterologists have never seen any injury result Almost all reported bowel perforations have occurred through diseased areas of the wall and the majority have resulted from blow outs by insufflated air Often these have broken through far above the area being examined and even the cecum has been ruptured during sigmoidoscopy If *the instrument itself is properly handled it* cannot injure the bowel wall Instrumental perforations will result if it is used as a probe to find the lumen or if it is used as a dilator for strictures Another hazard is the sticking of an inadequately lubricated instrument against the perianal skin from where it may suddenly be released upon a little pressure and shoot forward against the bowel wall

Removal of a biopsy specimen is occa sionally followed by important and even serious hemorrhage The threat of postbiopsy bleeding is in fact considerably greater for the sigmoid and rectum than it is for esopha gus or stomach It is remarkable how in *effective the natural hemostatic mechanisms*

ease to local neuromuscular dysfunction or to some purely circumstantial factor The symptom calls for specific diagnosis and a considerable amount of study and thought is sometimes required before one can be certain of the causal mechanism

Configurational abnormalities such as ptosis dolichocolon and redundancy are not at all important Mechanical obstructive lesions may cause acute or recurrent constipation or obstipation but not chronic constipation Static incomplete obstruction is more likely to produce diarrhea than constipation The mechanical problem caused by weak abdominal wall muscles diastasis recti or late pregnancy on the other hand may contribute significantly to a constipation tendency Similarly people with chronic pulmonary emphysema often develop habit constipation because they cannot hold their breath long enough to produce an effective Valsalva effort In some cases chronic subnormal hydration appears to aggravate the problem Acute illness prolonged bed rest and incarceration in a body spica create expulsion difficulties which often lead to situational constipation A very common but ordinarily brief type of situational constipation is that which temporarily follows a change in geographic location or accompanies a long trip

By far the majority of cases of chronic constipation are due to disturbed nervous regulation of the colon and rectum This may include both their motor activities and their sensory reflexes at times with depressed mucus secretory ability as well This type of disturbance may be subclassified in several ways the most useful being based on the specific tonic disturbance and site of stasis Thus there are atonic and spastic colonic and rectal forms The bases for the neuromuscular faults are believed to be many common ones being simple nervous dyskinesia obtunding of the defecation reflex through voluntary failure to respond in effectiveness of the defecation stimulus through chronic use of irritant laxatives and probably disturbances at much higher levels particularly recurrent acute psychic upsets

Chronic constipation among children is often due to faulty habit secondary to the inconvenience felt by small people in having to interrupt play in order to go to the bathroom Anxious parents can only aggravate the situation if they make an issue by coercing the child to move his bowels for he is likely to react by a very natural negativism Most parents have difficulty in understanding that the child will be healthier as far as his bowel is concerned if his defecatory habits are parentally ignored The common misconception that the frequency and size of bowel movements are important to health can be a malignant one in the rearing of children

TYPES OF FUNCTIONAL CONSTIPATION

Chronic atonic constipation (Lane s disease) is not a common form in the adult but it probably is present to some degree in about 10 per cent of otherwise normal infants and children It seems to represent inborn relative weakness of the colon musculature which in many cases becomes compensated for with attainment of adulthood Adults with persisting chronic atonic constipation almost always give a history which goes back to childhood The trouble is in the muscular activity of both the colon and rectum and the result is delay of arrival all along the line Most of the stasis occurs in the right side of the colon and the rectum The rectal *phase of defecation lacks automation* entirely in some cases The roentgenologic picture is characteristic Very often the radiologist discovers that preparation for the study was completely ineffective in clearing material from the ascending colon Haustral activity is weak or almost absent everywhere although usually the transverse colon is a little less affected than the other segments Both moderate dilatation and elongation of the colon are found There is not the extreme change found in Hirschsprung s disease The two conditions may be easily differentiated by digital examination because in atonic constipation feces can al

may be deposited in the rectal wall follow ing nozzle trauma An eleoma or oil granu loma may be the result This is a very chronic foreign body type of granulomatous tumor which grows slowly but which eventu ally may produce the local effects of a small rectal tumor Barium granulomas of the rectum produced in a similar fashion have been reported following barium enema

Even in the absence of perforation the nature of the fluid is of considerable im portance in determining the safety of an enema Sometimes poisons such as lye or sodium fluoride are used by mistake to pre pare the solution A markedly hypertonic solution may cause fulminating colitis with quick destruction of the mucosa hemorrhage electrolytic shock and death In some sensi tive people a simple soapsuds enema pro duces superficial colitis which may last several days If the fluid is administered while it is hot there may be mucosal sloughing im mediately and the cicatricial response of thermal injury later

Water intoxication following administra tion of a large amount of tap water is a serious threat to patients with megacolon and is a possibility in normal infants and young children When barium sulfate suspension is made up in tap water rather than saline solution fluoroscopic examination of the patient with megacolon must be considered *hazardous Within a very few minutes there may be rapid fall in the serum electrolytes* and hyponatremic shock with weakness sweating vomiting cough syncope and col lapse It is a good plan to use saline solution instead of tap water for all enemas and this is a necessity in the case of infants chil dren and people with a large colon

CONSTIPATION

Constipation is a manifestation of many diseases and a complaint of great frequency It is a homely symptom not yet studied with real enthusiasm and not well *understood* Constipation is difficult enough even to de fine and about the best one can do is say that it implies either *delay* or *incomplete* ness in the evacuation of feces The total gastrointestinal transit time varies normally from 12 to as many as 120 hours Most material is usually evacuated within 40 hours Following a barium meal however an average of about 70 hours is required for the normal adult intestinal tract to rid itself completely of barium even though the great mass of it will have been passed within half this time Because the residuals of a *meal become dispersed through several* days evacuations it is more realistic to de fine constipation on the basis of stool char acter than on measured transit time or on frequency of bowel movements Thus a person may have an evacuation every day but still be several days behind as far as the amount of feces remaining in the colon is concerned

Constipation then means hard stools Food residues normally spend most of their resting time in the cecum and adjacent ascend ing colon prior to preparation for defecation and most of their water content is absorbed here Six to eight hours are generally utilized for this The trip across to the descending colon and sigmoid is quickly accomplished The normal storage region for feces *until* the moment before defecation is the sigmoid Water absorption is efficient here too and if *abnormal stasis occurs the mass becomes* very hard and successively subdivided As a general rule it can be concluded that *scybalous or highly segmented* feces have *sojourned at least 100 hours in the gastro* intestinal tract It must be remembered that partly or well formed feces may pass each other in the colon so it is possible for scybala to be evacuated a few hours after a normal stool Furthermore severe constipa tion often stimulates reactive diarrhea In ad dition to hardness and increased segmenta tion a constipated stool is often darker than normal because the longer *bile pigments* remain in the bowel the deeper their color becomes

CAUSES

The symptom constipation may be due to local organic disease within or outside the colon rectum or anus to generalized dis

often do not appear until middle age arrives

The former concept of intestinal autointoxication as the mechanism for explaining the far removed manifestations of constipation is no longer believed to be valid Although it seems that toxic materials may be formed in the colon these are either quickly destroyed or are not absorbed Local distention organ displacement and autonomic reflexes seem to offer the best explanation

Headache and over all sick feeling are the two common complaints The headache is generalized and is of the pulsatile type synchronous with the heart beat and aggravated by jarring It is always the same and the patient knows well its significance It usually disappears quickly following a large bowel movement and for this reason it seems certain that it is due to an autonomic reflex of some sort Anorexia nausea pyrosis gas sense of epigastric fullness and insomnia are in some patients symptoms which seem to be causally associated with chronic constipation at least the patient is often convinced of the connection and the complaints often clear when the constipation is corrected Mental depression is a possible sequel of an isolated spell of constipation and when there is chronic recurrent constipation it is not unusual for the family to notice coincident mood swings When paraplegic patients are permitted to become constipated the blood pressure may temporarily rise significantly and there is a certain danger of cerebral hemorrhage

TREATMENT

Each gastroenterologist has his own favorite way of managing the patient with chronic constipation There are many regimens that work fairly well few that offer the patient a solid solution for his problem In general the effort should be directed towards correction of the neuromuscular fault In the elderly patient this rarely is practicable and symptomatic help is the most that can be offered There are many younger patients for whom all treatment aimed at cure seems ineffectual There will be little argument that chronic functional constipation is one of the more difficult gastroenterologic problems in therapy

The purpose of treatment in atonic constipation is stimulation of propulsive activity in the hypertonic type it is conversion of the muscular dysrhythmia to a rhythm of propulsion and in dyschezia it is re-establishment of the defecatory reflex For all types increased fluid intake and abdominal exercises are helpful The latter however must be faithfully carried out over a period of many months and then at intervals indefinitely and most patients do not like to do this Increased fluid intake by itself does not of course have any effect on the consistency of the stool there being no relationship between the amount of fluid taken in and the bowel s fluid content It does however appear to influence the amount and rapidity of mucus secretion by the bowel and further more for local mechanical help it can be made to stay within the bowel lumen by the use of hydrophilic gums The day of prescribed concentrated irritating laxatives is gone or almost so although the stimulating foods will always be important helps for the constipated patient

In *atonic constipation* fluid and exercise are particularly important Large doses of thiamin help some patients The natural foods known to stimulate the colon directly are relied upon heavily—prunes dried apricots figs dates and for some people buttermilk For stimulation of the gastrocolic reflex should one be educible hot coffee or two glasses of warm water taken early in the morning help a portion of patients The vegetable mucilaginous bulk producers which have been used for the purpose for more than 1000 years or their substitute methylcellulose are of moderate usefulness for some patients and seem to solve the problem for a few

For *hypertonic constipation* the vegetable mucilaginous bulk producers offer the greatest help Agar dextrose and psyllium dextrose are good for this purpose The dextrose is

ways be felt in the rectum while this is not possible in Hirschsprung's disease The stool in atonic constipation becomes hard but tends to remain cylindrical Scybala are not formed

The spastic or *hypertonic type of constipation* is the common one when the colon is at fault Here the problem is entirely that of delay in arrival of feces at the rectum *The rectal phase of defecation is normal* Transit through the colon is everywhere slow but stasis is greatest in the descending colon and sigmoid Again the transverse colon is responsible for relatively little delay Certain types of hypertonicity of the colon of course can lead to diarrhea and it must be assumed when constipation results that the muscular activity is almost entirely that *of segmentation rather than propulsion* There is in other words intersegmental incoordination Here scybala are formed consistently if the period of stasis is long enough The patient may have a bowel movement daily but the nature of the stool is abnormal because it is a few days late Upon abdominal examination the descending colon and part of the sigmoid are usually palpable and hard fecal masses are often evident Digital examination shows the rectum to be empty Roentgenologic study reveals that the sigmoid and descending colon form a rather narrow spastic tube Some of the transverse colon may show a similar change but usually the ascending colon appears quite normal Short segments of spasm may form and persist for half an hour or more If the radiologist removes his glove he can sometimes feel the segments through the abdominal wall

The third common type of functional constipation is *rectal constipation* or dyschezia Probably half or more cases of chronic constipation fall into this category The causes are well known involving for the most part poor defecatory habits meaning failure to permit *the rectum to empty* itself immediately after the sigmoid releases its contents to it The other types of constipation are not directly controllable by the patient at the onset but this is Simple laziness in failure to respond to the defecatory stimulus is the reason in many cases In others occupation may not permit the patient to respond—travellers soldiers guards policemen internes etc Less often anal disease causes enough pain or fear of pain to encourage retention of feces Here a distressing cycle is set up because constipation *must invariably aggravate anal disease* A moderately common but neglected cause of rectal constipation is that which is forced upon the woman who has a relaxed perineum and who is therefore not able to furnish adequate support for rectal emptying The transit time through the colon is not abnormal in this type of constipation but the rectum fails to empty or empties incompletely There may be a few or even several fragmentary bowel movements daily The rectum becomes atonic as the defecatory reflex is lost and eventually no impulse is felt no matter how great distention becomes The stools tend to be partly fragmented and partly of large caliber Upon rectal palpation feces are always encountered even immediately after a bowel movement Roentgenologic examination shows no more than a capacious rectum and normal colon

SYSTEMIC MANIFESTATIONS

Constipation is a symptom only if the patient is bothered by it and a great many people who think nothing about it have what others would consider severe constipation It is not unusual during the interview with a patient who has some other problem to discover that his bowels move only once every five or seven days and consist of marbles Often enough the patient's remark is Doesn't everybody? One acquires the impression that fecal stasis is less likely to cause trouble in men than women although there probably is no important sex difference in the incidence of stasis Another interesting common observation is that chronic constipation ordinarily begins early in life but its far removed manifestations

often do not appear until middle age arrives

The former concept of intestinal autointoxication as the mechanism for explaining the far removed manifestations of constipation is no longer believed to be valid Although it seems that toxic materials may be formed in the colon these are either quickly destroyed or are not absorbed Local distention organ displacement and autonomic reflexes seem to offer the best explanation

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added to the hydrophilic mucilloid substance for its dispersing property There is no pre cise dose for these preparations but two or three teaspoonfuls daily seem to work best for most persons and increasing the dose does not appear to improve the re sults It is very important that any bulk preparation be taken slowly and with a lot of water especially if it should be prescribed in tablet form because there is a certain danger that hydrophilic substances may stick and accumulate in the distal esophagus to form an obturating plug It is not clear why merely increasing the amount and fluid content of the fecal mass should increase the speed of transit through the colon or how it could cause propulsive activity to dominate over segmental activity but through clinical observation it is certain that for many pa tients it does It is frequently advised for theoretical reasons that the patient with hypertonic constipation eat or take nothing which might irritate the colon but this is not good advice for all patients Regular use of prunes or synthetic prune substitutes in addition to a hydrophilic substance is often most helpful Enemas are not used for the treatment of colonic constipation

Rectal constipation is the most difficult type to manage Except in the younger pa tient often only a little can be accomplished in the way of cure It is only here that enemas have any place and then only at the start The purpose is to get the rectum empty and to keep it so as much as possible except at defecation for about three weeks in order to see if its tone will be regained If the results are good one may assume that it is possible for the defecatory reflex to return with the patient s help An intelligent degree of cooperation and enthusiasm must be engendered in the patient because often at the start he is interested in no more than obtaining a new pill with which to manage his problem He is instructed to take a small tap water enema every morning immediately upon arising Sometimes at first a hydrogen peroxide retention enema is necessary to help rectal evacuation Meanwhile a hy drophilic mucilloid is taken regularly This is continued indefinitely but the enemas should be discontinued after about three weeks If they are going to do any good in permitting return of the defecatory reflex they will have done so by then Prolonged use of enemas can only lead to further obtunding of the reflexes It goes without saying that once a rhythm has been es tablished the patient must assume the re sponsibility for following through with practice of proper defecatory habits

FECAL IMPACTION AND FECALOMA

To every clinician the problem of fecal impaction is well known and he can well recall hours spent as an interne in digitally ridding old people and chronic invalids of fecal masses which could not otherwise be evacuated The material which collects in tremendous amounts in some cases comes to rest mostly in the rectal ampulla It is not uncommon here for the impacted mass to lie out of the way of the main fecal stream for long periods Thus although rectal obstipation is produced in most cases in others the result is a relentless side tracking diarrhea The cause for a large portion of cases of diarrhea in elderly people is dis covered as soon as impaction is recognized upon rectal examination In carrying out treatment it is found that oil retention enemas are not very useful for softening the mass Much more satisfactory results are obtained by retention of either a solution of com mercial detergent such as used for washing dishes or hydrogen peroxide Often however the rectum can be cleared only with the help of digital manipulation

A fecaloma is the final stage of the con stipation process It is a hard roughly sphe roid fecal tumor which lies within the distal colon or rectum Very rarely one may form in the small bowel or cecum As time goes on the mass becomes very large and there may be calcification Remarkably huge fecalomas are sometimes encountered Some of these show lamination and then often the successive layers vary considerably in

their consistency Most fecalomas develop in association with simple chronic constipation Others occur in cases of megacolon chronic incomplete sigmoidal or rectal stricture tumors of the distal colon and long retained ingested foreign bodies The latter include simple fruit seeds and undissolved medicinal tablets particularly such relatively insoluble ones as Blaud s pills Tremendous fecalomas sometimes remain asymptomatic as far as the bowel is concerned but produce secondary ureteral or bladder obstruction or interfere with uterine activity at the time of parturition

A fecaloma is detected and identified through abdominal palpation digital examination of the rectum sigmoidoscopy and barium enema roentgenography If the mass should be partly calcified detection is made easier but identification may become more of a problem

Elimination of a fecaloma may ordinarily be accomplished through long continued use of detergent retention enemas plus mineral oil by mouth Mechanical destruction of the mass through the sigmoidoscope is sometimes possible by running detergent solution into its center by trocar but this presumably is a dangerous maneuver Transabdominal surgical extirpation is infrequently necessary

ANOMALIES

Malformations which are of clinical importance are somewhat less common in the colon than in most other parts of the gastrointestinal tract Those which ordinarily go unnoticed however under rare circumstances cause secondary illness and they may in addition interfere with treatment of some other problem (Fig 134) Simple incomplete or faulty rotations are the most common anomalies The cecum may come to lie high in the right upper abdominal quadrant or low in the pelvis All of the colon may be on the left side of the abdomen Rarely do these misplacements lead to acute torsion or other obstructing process but they may confound clinical diagnosis of certain acute abdominal diseases especially appendicitis Steeple colon and its reverse counterpart sometimes encourage development of the splenic and hepatic flexure syndromes

Atresias and *stenoses* are the most important anomalies They are due simply to failure of the lumen to develop there being no fetal process which could account for stenosis once the colon has developed its mucosa Any grade of stenosis in addition to atresia may result Development of multiple areas of atresia is an uncommon variation When atresia exists the infant becomes distended within a day of birth there is vomiting and no meconium is passed Occasionally perforation occurs proximal to the atretic segment By plain x ray examination the extent of bowel dilatation can be determined and if the anus is patent barium enema fluoroscopy gives important information regarding the caudad extent of the atresia Surgical relief of the obstruction is required as soon as the diagnosis is made Without treatment death follows within a few days the common immediate causes being fluid depletion and aspiration pneumonia Usually radical segmental resection with primary end to-end anastomosis can and should be carried out at the time The main technical problem is that created by the discordant diameters of the distended proximal and collapsed distal segments

Microcolon indicating relatively uniform narrowing without actual occlusion is a very rare congenital anomaly Microcolon may be associated with atresia higher in the gastrointestinal tract being then not a true anomaly but merely representing failure of physiologic distention due to enforced inactivity Following elimination of obstruction the colon balloons out normally

Hepatophrenic interposition of the colon (Chilaiditi s anomaly) is encountered about once per 1000 routine chest x ray films (Fig 135) Posterior interposition or migration of the transverse colon posteriorly up and over the liver is more common than anterior interposition In either case the length of the displaced segment and the completeness of the interposition may vary from time to

added to the hydrophilic mucilloid substance for its dispersing property There is no precise dose for these preparations but two or three teaspoonfuls daily seem to work best for most persons and increasing the dose does not appear to improve the results It is very important that any bulk preparation be taken slowly and with a lot of water especially if it should be prescribed in tablet form because there is a certain danger that hydrophilic substances may stick and accumulate in the distal esophagus to form an obturating plug It is not clear why merely increasing the amount and fluid content of the fecal mass should increase the speed of transit through the colon or how it could cause propulsive activity to dominate over segmental activity but through clinical observation it is certain that for many patients it does It is frequently advised for theoretical reasons that the patient with hypertonic constipation eat or take nothing which might irritate the colon but this is not good advice for all patients Regular use of prunes or synthetic prune substitutes in addition to a hydrophilic substance is often most helpful Enemas are not used for the treatment of colonic constipation

Rectal constipation is the most difficult type to manage Except in the younger patient often only a little can be accomplished in the way of cure It is only here that enemas have any place and then only at the start The purpose is to get the rectum empty and to keep it so as much as possible except at defecation for about three weeks in order to see if its tone will be regained If the results are good one may assume that it is possible for the defecatory reflex to return with the patient s help An intelligent degree of cooperation and enthusiasm must be engendered in the patient because often at the start he is interested in no more than obtaining a new pill with which to manage his problem He is instructed to take a small tap water enema every morning immediately upon arising Sometimes at first a hydrogen peroxide retention enema is necessary to help rectal evacuation Meanwhile a hydrophilic mucilloid is taken regularly This is continued indefinitely but the enemas should be discontinued after about three weeks If they are going to do any good in permitting return of the defecatory reflex they will have done so by then Prolonged use of enemas can only lead to further obtunding of the reflexes It goes without saying that once a rhythm has been established the patient must assume the responsibility for following through with practice of proper defecatory habits

FECAL IMPACTION AND FECALOMA

To every clinician the problem of fecal impaction is well known and he can well recall hours spent as an interne in digitally ridding old people and chronic invalids of fecal masses which could not otherwise be evacuated The material which collects in tremendous amounts in some cases comes to rest mostly in the rectal ampulla It is not uncommon here for the impacted mass to lie out of the way of the main fecal stream for long periods Thus although rectal obstipation is produced in most cases in others the result is a relentless side tracking diarrhea The cause for a large portion of cases of diarrhea in elderly people is discovered as soon as impaction is recognized upon rectal examination In carrying out treatment it is found that oil retention enemas are not very useful for softening the mass Much more satisfactory results are obtained by retention of either a solution of commercial detergent such as used for washing dishes or hydrogen peroxide Often however the rectum can be cleared only with the help of digital manipulation

A fecaloma is the final stage of the constipation process It is a hard roughly spheroid fecal tumor which lies within the distal colon or rectum Very rarely one may form in the small bowel or cecum As time goes on the mass becomes very large and there may be calcification Remarkably huge fecalomas are sometimes encountered Some of these show lamination and then often the successive layers vary considerably in

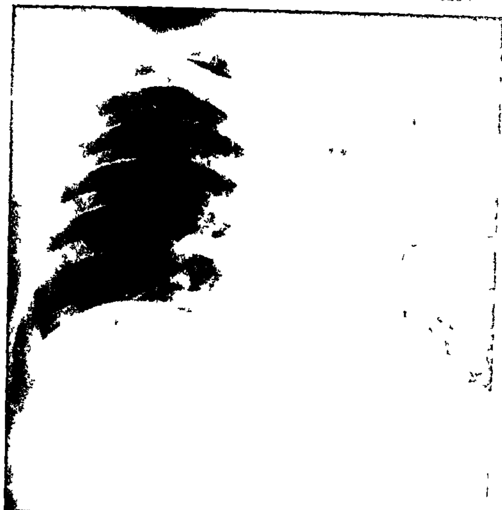


Fig 135 Chilaiditi's anomaly (hepatodiaphragmatic interposition of the colon) as observed on routine chest film

MECHANICAL DISEASES AND OBSTRUCTION

When the colon takes part in such mechanical diseases as volvulus and intussusception the pathogenic processes and therapeutic principles are much like those observed when the small bowel is involved An effort will be made to avoid repetition but a few points particularly applicable to the colon must be reviewed

Colon obstruction due to mechanical causes such as obturation and torsion is not nearly as common as that of the small bowel if fecal impaction is excluded Primary carcinoma is responsible for approximately half the cases Other causes are volvulus ileocolic intussusception diverticulitis secondary peritoneal carcinoma and strictures secondary to diffuse inflammatory diseases In addition there are a few obstructing processes which are quite unique to the colon Thus acute angulation at the splenic flexure due to adhesions between the transverse and descending colon may cause incomplete chronic obstruction (Payr's disease) When the colon is greatly distended by gas or swallowed air its partly retroperitoneal and partly mesenteric fixation permit acute angulations to develop with acute obstruction Many varieties of intussusception



Fig 134 Congenital transposition of the colon in the absence of any other evidence of situs inversus The anomaly *caused no problems It was discovered incidentally* during a pelvic operation

time As a congenital anomaly it may be found at any age but it should be noted that there is a much rarer acquired form of interposition Men are more likely to have the anomaly than women Sometimes Hirschsprung s disease or acquired megacolon is also present The anomaly is not of clinical importance as long as it is not misinterpreted as pneumoperitoneum in the patient who develops acute abdominal pain It is almost always discovered as an incidental roentgen finding and the radiologic diagnosis is ordinarily not a difficult matter People with Chilaiditi s anomaly have no immunity to bowel perforation so that during the interpretation of films special attention to the possibility of associated pneumoperitoneum is always required Thin haustrations traversing the gas shadow are diagnostic (Fig 81) The right leaf of the diaphragm is not usually elevated but rather the liver may be rotated downwards a short way

it is such a relative manifestation because normal physiology calls for wide variations in colon diameter and because it is only secondary evidence of something more important Etiology of megacolon is varied Atonic constipation produces the most familiar type Chronic partial obstruction such as sometimes produced by recurrent diverticulitis occasionally leads to megacolon Acquired megacolon is common in parkinsonism being at least partly explained by the autonomic effects of drug therapy Psychotic people especially schizophrenics are able to generate a severe degree of megacolon through chronic refusal to defecate In addition there is often severe visceral hypotonia in these patients and dolichocolon develops too Regularly the rectum takes part in the process and sphincter control is poor Megacolon as a complication of ulcerative colitis is discussed below Then there is Hirschsprung s disease

HIRSCHSPRUNG S CONGENITAL MEGACOLON

Hirschsprung s congenital megacolon is a neurologic disease of a variable portion of the distal large bowel manifested by secondary passive dilatation of normal portions of the colon and sometimes small bowel due to severe fecal retention About 90 per cent of the babies are males and there is a tendency towards familial disposition The incidence among live births is approximately 0 005 per cent

During the past few years etiology has been worked out to an acceptable conclusion through histopathologic investigation The disease lies in the distal undilated portion of the large bowel Ordinarily this segment involves the rectum and part of the sigmoid It extends as high as the splenic flexure in about 10 per cent of cases The entire colon is involved in about 1 per cent and then it is the small bowel which becomes passively dilated In all cases at least the internal anal sphincter the rectum and the rectosigmoid junction are involved The anatomic abnormality of the narrow segment is congenital absence or severe deficiency of the ganglion cells of Auerbach s plexus and to a lesser degree of Meissner s plexus Nonmyelinated nerve fibers are present bu there are no ganglionic connections

The result of the autonomic deficiency is creation of a distal segment of functional colon obstruction The segment receives motor stimuli from the orad portion but it is not capable of peristaltic conduction When a peristaltic wave reaches the aganglionic portion an intense spastic contraction results and then the stimulus dies As a result feces become packed into the colon There is progressive passive dilatation of the autonomically well-endowed part of the colon Water absorption capacity remains unimpaired Soon after birth the colon diameter becomes very large and there is progressive elongation (Fig 136) This is merely the normal reaction of a neonatal colon to chronic obstruction The mural response for a long time is one of hypertrophy with great thickening of the bowel wall especially through its muscle layer Eventually decompensation must supervene and the wall becomes thin with fibrosis through all layers

In most cases constipation is apparent shortly after birth Even passage of meconium may be delayed Enemas give good results but there may be no spontaneous bowel movements Periodic diarrhea is not uncommon nor is vomiting Sometimes the infant gets along well enough except for infrequent bowel movements and no abnormality is recognized for several weeks Hirschsprung s disease is however a potentially dangerous process in infancy and without treatment it may kill through obstruction If the child survives there may be severe inanition and secondary infection is common

In an occasional patient childhood or rarely adulthood is attained before trouble in the form of constipation and abdominal distention is recognized It is distinctly unusual to encounter a virgin case of true Hirschsprung s disease in an adult but if such should happen it is ordinarily found that the patient has grown up and matured quite normally and that he seems in good

involve the colon but most of these begin in the ileum close to the ileocecal valve as described elsewhere

Clinically acute obstruction of the large bowel does not cause as desperate a picture as does high obstruction The over all mortal ity rate is usually said to be about 15 per cent with modern therapeutic technics Often pain is absent and the only discomfort is that which is due to distention Hypogastric cramps develop early in some patients but disappear after a few hours There may occasionally be vomiting but because this is never severe dehydration does not become an important clinical problem There is never more than mild electrolyte loss Shock due to the obstruction itself does not occur There is always abdominal distention and this may progress to reach tremendous pro portions Obstipation is constant When the sigmoid is obstructed megarectum may be found on digital rectal examination

Plain x ray films of the abdomen are important for judgment of the degree and distribution of bowel distention Barium enema is the most useful diagnostic measure It is interesting that early in large bowel obstruction whether atonic or mechanical the leukocyte count is often depressed In treatment of obstruction this low in the gastrointestinal tract decompression by trans gastric tube is not useful

VOLVULUS

For volvulus to occur both a mesenteric attachment and a degree of redundancy are necessary Probably any abnormality in colon motility may predispose to rotation and merely chronic constipation and attacks of acute diarrhea sometime seem to be respon sible Dyskinesia secondary to certain central nervous system diseases and to peripheral processes such as chronic lead poisoning may apparently play a similar role if the anatomic conditions are right In more than two thirds of the cases the sigmoid is the segment involved as would be expected from its favorable mesenteric set up Volvulus of the cecum is much less common and is usu ally associated with volvulus of the terminal ileum It is probable that the fixation muscle system of the cecal area normally stabilizes the parts too well to permit rotation This system consists of muscle connections within peritoneal folds from the muscularis propria to the abdominal wall In perhaps 2 per cent of the cases the volvulus involves the trans verse colon Volvulus of the ascending colon is a curiosity

Acute volvulus is largely a disease of young people It develops rapidly and gangrene characteristically supervenes quickly after a fulminating clinical course More com monly volvulus is a subacute or recurrent process The patient is likely to be of mid dle age or older and usually there is a history of chronic constipation and of previ ous attacks The course is more moderate although gangrene is a potentiality

Roentgenologically a greatly dilated loop of colon is found with less distention orad to the area of obstruction In cases of sigmoid volvulus the dilated loop comes to lie in the right side of the abdomen Upon barium enema fluoroscopy a characteristic duck bill deformity is found at the site of obstruc tion as the twist narrows the lumen to a point This is a diagnostic sign

Sometimes subacute sigmoid volvulus can safely be reduced with the help of the sig moidoscope whereupon a large catheter left in place permits decompression prior to leisurely resection of the sigmoid Ordinarily direct surgical manipulation is required for reduction and the emergency of the clinical situation is pressing The cecal area can effectively be stabilized by fastening it in the retroperitoneal position but when the sigmoid is involved segmental resection of the redundant portion is usually necessary even if it is quite viable in order to preclude recurrence

MEGACOLON

Megacolon merely means chronic dilata tion of the colon with or without dolicho- colon or abnormal increase in length It is a difficult subject to think about because

saline or gelatin solution There is serious threat of acute water poisoning in the patient who has megacolon if a plain tap water suspension is used In addition simply increasing the degree of mechanical distention of the colon is poorly tolerated by these babies cardiac standstill being on occasion the result

Treatment in all cases should be surgical and it ordinarily should be carried out as soon as the diagnosis is established Non surgical management of many forms has been used for years but it never actually solves the problem nor can it assure normal physiologic development of the growing child Most surgeons prefer the Swenson Hiatt operation or a variation consisting of resection of the achalasic segment the transitional zone and a variable portion of the dilated colon A pull through is done and anastomosis made just above the anal line



Fig 137 Megacolon due to severe chronic habit constipation in young child not to be confused with the congenital variety Note that there is no segment of rectal narrowing

A one stage operation seems preferable In the State procedure the rectum is preserved and a higher anastomosis made so that the nervi erigentes will not be disturbed When the whole colon makes up the diseased segment total resection is done and an ileoproctostomy is made The results of surgical therapy are excellent Cure is obtained and no further care is indicated

general health Complete obstruction is unusual in the older child even though days or weeks may elapse between bowel movements Many patients adjust well to this enforced physiologic program Others have been started on an enema regimen at an early age There is little actual discomfort If a person grows up with the disease a noisy abdomen may be his chief complaint The abdominal configuration is such when the patient is erect that girls may worry about accusations of pregnancy

amounts of gas are present Rectal examination shows a normal anal canal and a narrow rectum free or almost free of feces This is most important for physical diagnosis Impacted feces cannot be reached with the finger in Hirschsprung s disease although the mass formed by feces contained in the bowel above can be felt Chronic habit constipation is common in children and can simulate Hirschsprung s disease but here the fecal mass is in the rectum and can easily be reached (Fig 137)



Fig 136 Operative findings in case of young man with Hirschsprung s congenital megacolon

The important complication is volvulus of the colon usually the distal portion of the dilated segment The surgical problems met at emergency laparotomy are such that if gangrene has already developed few patients will survive Chilaiditi s anomaly is sometimes found in Hirschsprung s disease but apparently contributes no special problem

Physical examination characteristically shows a moderately well nourished baby or child with a large rather firm abdomen and tense thin abdominal wall Colon can not be outlined but it is often possible to recognize the retained feces by their consistency Percussion shows that only moderate

Evaluation of the extent and degree of the process can be made only by barium enema fluoroscopy A plain film ordinarily reveals a great mass of retained feces filling most of the abdomen and this furnishes diagnostic help (Fig 138) With contrast medium it is found that a variable length of rectum and perhaps sigmoid or more is entirely normal or slightly narrow More proximally the bowel is tremendously dilated to a few or many times its normal diameter There is dolichocolon too and the result is that with overlapping of the colon segments most of the abdominal area becomes opacified It should be recalled that the barium suspension must be made up in isotonic

DIVERTICULOSIS AND DIVERTICULITIS

DIVERTICULOSIS

Diverticulosis of the colon is a very common acquired condition among older people yet clinical disease secondary to diverticulosis is relatively quite unusual Although actually rare among people less than 30 years old the incidence of diverticulosis increases rapidly as age advances The problem in arriving at precise incidence figures is that diagnosis depends on roentgenologic study—which is much more accurate than autopsy examination—and only a select group of people are examined roentgenologically For this reason some estimates may be much too high For similar reasons it is easy for one s surgical colleagues to become overly impressed with the frequency of its complications Various estimates have it that from *10 to 50 per cent* of people past 40 years of age have developed diverticulosis Probably the figure 25 per cent reflects a fairly accurate incidence for diverticulosis among people over 60 years old and possibly 3 per cent of people with diverticulosis have trouble of some sort from it There appears to be no sex preference

Diverticula of the colon develop in response to intraluminal pressure which as life proceeds cannot be wholly contained by mural integrity If a person with diverticulosis should have had periodic barium enemas over the years the successive films will show that at first haustral activity was normal or perhaps excessive then small temporary or functional pouches were created simply through muscular activity from time to time and finally the diverticula were pushed through the muscularis propria to become permanent noncontractile diverticula Many people with diverticulosis give a history of chronic hypertonic constipation and many have been obese all their lives It is common to find that those who seek medical help have other abdominal disease—at least 50 per cent do—and in addition to suggesting that diverticulosis is usually a silent process this raises the etiologic question of whether far removed diseases which have an irritating quality might be responsible for reflex colon dyskinesias which would encourage development of diverticular sacs

Except perhaps at the outset colon diverticula *are always multiple in contrast to* cecal diverticula There may be hundreds and these may be scattered along the whole organ or concentrated within a short segment The sigmoid ordinarily is the site of most and usually it is the segment involved when their distribution is limited Diverticulosis of the ascending colon comparatively is rare being present in no more than 5 per cent of cases Individual diverticula may enlarge up to a diameter of about 2 cm but seldom beyond In mesenteric portions of the colon most grow out into the mesenteric attachment It appears that a great many follow the paths of larger blood vessels as they pierce the bowel wall The diverticular fundus is ordinarily considerably wider than its neck Histologically no muscularis *propria is found in the wall of a diverticulum* but the other three layers are well represented Aberrant mucosal islands are not found

Detection of simple diverticulosis is the privilege of the radiologist The typical picture is well known (Fig 139) In the absence of any complication it can hardly be confused with more important disease It is a strange thing but diverticula known to be within reach of the sigmoidoscope can only *rarely be seen endoscopically* Diverticulosis for all its frequency is one of the most unusual diagnoses to come from the sigmoidoscopy clinic

When there is no complication diverticulosis does not cause symptoms Because the condition often develops in people who have a hyperactive colon or chronic hypertonic constipation there may be colon symptoms but the little sacs cannot be blamed Discovery of uncomplicated diverticulosis upon investigation of bowel complaints must not lead to automatic assumption



Fig 138 Plain abdominal film in case of Hirschsprung's megacolon The fecal shadows are close to diagnostic

DIVERTICULITIS PATHOLOGY

Diverticulitis is a disease of middle and late life It is extremely rare in people younger than 30 years and in fact in the young person a constricting colon lesion is much more likely to be cancer than diverticulitis Although there seems to be no sex preference for diverticulosis at least twice as many men as women develop diverticulitis The risk of diverticulitis among people with diverticulosis is unknown because the true incidence of diverticulosis is unknown it appears to be slight and as by far the main complication can perhaps be said to be about 3 per cent

The common sites along the colon for diverticulitis to develop follow in general the pattern of diverticulum distribution Thus the sigmoid is the affected region in about three quarters of the cases while diverticulitis of the ascending colon is rare Ordinarily only a relatively short segment of bowel takes part Although all of the diverticula along a few or several centimeters of the colon may become involved in the inflammatory process those elsewhere along its course remain uncomplicated Each time recurrence develops the inflammation usually affects the same segment

Trouble starts when a diverticular neck becomes occluded as is always the way with inflammation of blind structures In most cases it seems likely that the incitant for occlusion comes from within the bowel lumen for a few or several adjacent diverticu a usually become inflamed at the same time The diverticular fundi may or may not contain inspissated feces at the time Acute inflammation of the diverticulum s mucosa is the natural consequence of obstruction Unless spontaneous emptying can be achieved an abscess must form The infection quickly extends through the wall and local peritonitis then deve'ops Peridiverticular reaction soon becomes extensive encouraging formation of adhesions and a large amount of inflammatory response For this reason free perforation with spreading peritonitis is most unusual When the surgeon approaches the area he is usually surprised by the large amount of reaction he finds The diverticular abscesses may rupture back into the bowel or they may penetrate into the mass of peritoneal reaction Local paracolic abscesses form and there may be extensive sinus activity eventuating sometimes in fistula formation Fistulas are not common but in some cases they prove to be by far the most serious complication of the process Fistulas may join with other portions of the colon the bladder vagina small bowel abdominal wall or perineum

The state of chronicity marked by recurrent activity leads to eager fibrosis and this plus the encircling mass of acute and chronic inflammatory tissue causes narrowing of the diseased segment A high degree of obstruction may develop There may be periodic drainage of pus into a mesenteric vein leading to pylephlebitis and eventual obliteration of the portal vein with production of portal hypertension Liver abscess is a rare complication of diverticulitis—no surprise because the liver s reticuloendothelial defense against the colon s bacterial flora is known to be almost perfect unless it is continually being flooded by organisms There is no tendency towards carcinomatous transformation

DIVERTICULITIS CLINICAL ASPECTS

The most characteristic clinical feature of diverticulitis is recurrence Often the series of attacks establishes a pattern which becomes quite predictable to the patient The symptoms depend on both the degree and location of the inflammatory reaction plus the amount of temporary bowel obstruction which results Pain is the most important complaint Its precise localization waits upon peritoneal irritation there usually being central abdominal cramping visceral pain first and localized parietal pain somewhere in the lower half of the abdomen later on *It tends to act very much like the* pain of acute appendicitis in some cases giving rise to the reference of left sided appendicitis but usually there



Fig 139 Extensive diverticulosis of the colon

of cause and effect Both the complaints and the diverticula are instead secondary manifestations of a dyskinetic or hyperactive bowel It is an important clinical observation as mentioned that half of diverticulosis patients have more important disease elsewhere in the abdomen Chronic gallbladder disease is possibly the most common associated disorder Saint's triad is mentioned in the discussion of diaphragmatic hernia

No treatment is indicated for uncomplicated diverticulosis There is no evidence to suggest that anything a person with diverticulosis does or anything he eats exerts any influence over the probability of complication

Treatment of diverticulitis is a medical problem in most cases and ordinarily it is simple enough Antimicrobial medication rest and analgesia lead to subsidence in a week or so Extension of the infectious process is not expected but after a variable period of inactivity recurrence can be antici-



Fig 140 Characteristic roentgen picture of diverticulitis It is important to note that at the area of inflammation no diverticula can be identified to assist diagnosis

pated for patients who have had similar attacks previously

Surgical treatment is proving to be quite satisfactory for certain forms of the disease Paracolic abscess fistula obstruction and inability to differentiate carcinoma are the most pressing indications but in addition mere periodic recurrence is proving in many cases to be most satisfactorily treated by segmental resection The indications are a bit difficult to define precisely but they have to do with the degree of recurrent disability and the promise of continued difficulty with the inflammatory mass Even though diverticula are present elsewhere on the bowel the usual practice is resection of the diseased segment only with end to end anastomosis If the process has quieted down for several weeks a one stage operation is done Otherwise, a temporary right transverse colostomy is made first and the resection and re establishment of continuity are carried out a couple of months later

is in diverticulitis much more in the way of reflex gastrointestinal activity Nausea and vomiting are very common even among these older patients Hyperactivity of the small bowel in addition to that of uninvolved portions of the colon leads to varying pains and cramps and these act early in the course to confuse the clinical problem Usually the bowels are disturbed from the onset of the attack There may be either diarrhea or constipation Temporary bowel obstruction add to the complexity of the clinical picture

Chills and fever are more common than they are with appendicitis Fever in the absence of other manifestations is not excessively rare apparently being explained by periodic bacterial flooding of the liver via the portal venous system In such cases there may be striking leukocytosis but blood cultures remain sterile because the liver blocks bacterial access to the systemic circulation

Extension of inflammation may lead to symptoms and signs suggesting primary disease in other organs Direct irritation of the bladder produces the manifestations of cystitis and only when a fistula breaks through to cause fecaluria may the true nature of the trouble suddenly become clarified Similarly the first subjective evidence of diverticulitis occasionally is dyspareunia The presence of infection may first come to light when an ischiorectal abscess breaks through or when a fistula opens onto the abdominal wall Fistulas can act in many bizarre fashions and other unusual initial manifestations are encountered from time to time

Diverticulitis acts then as both an acute and a chronic infection As the process continues it develops in one of two ways either as a recurrent acute infection leading to repeated attacks of low abdominal pain but clearing symptomatically during the interims or as a continuing chronic illness with superimposition of acute exacerbations The physical findings are those of infection acute or chronic a degree of bowel obstruction and whatever complications such as fistulization which may have occurred In the virgin case tenderness briefly is diffuse until there is parietal extension Then the location of tenderness indicates accurately the site of diverticulitis As already stated this is usually sigmoidal During the active stage a mass may sometimes be felt and when it cannot preclusion of adequate palpation by local tenderness is usually the reason

Although clinical suspicion of diverticulitis may be strong barium enema fluoroscopy is necessary for a precise diagnosis This examination is not contraindicated during the acute phase of the disease Uncomplicated diverticula may or may not be found elsewhere along the colon If they are roentgenologic interpretation is assisted considerably because at the area of diverticulitis the sacs themselves may not show The signs of diverticulitis are segmental spasm irritability and sometimes partial obstruction (Fig 140) Chronic fibrotic deformity is variable at the diseased area correlating roughly with the number of previous acute episodes Short sinus tracts may extend out from the affected portion If fistulas are present they may or may not fill with barium suspension The important diagnostic problem created by diverticulitis for the roentgenologist is exclusion of primary carcinoma of the colon He is sometimes unable to make the differentiation The roentgenologic manifestations of chronic diverticulitis are variable and specific diagnostic criteria can hardly be formulated Furthermore one finds that about 3 per cent of his patients with diverticulosis have carcinoma of the colon at the time the diverticulosis is discovered

Although uncomplicated diverticula are very difficult for the sigmoidoscopist to see diverticulitis of the sigmoid often produces secondary changes in the bowel lumen When inflammation is active sigmoidoscopy is a painful procedure Free pus is sometimes found and it is a common experience upon withdrawing the instrument to see a gush of pus suddenly appear in a bowel which up to that time seemed rather normal Often the sigmoid area seems restricted in its mobility Acute inflammation of the mucosa above the rectosigmoid junction is sometimes found

normality is the irritable colon syndrome In a large proportion of the cases there are gastric and duodenal symptoms of neuromuscular dyskinesia as well and probably it is best to think of the condition as irritable gastrointestinal tract syndrome The colon problem however is the main feature Many terms have been used for the syndrome nervous colon spastic colitis mucous colitis Smith s disease etc It is important to understand that there are no anatomic abnormalities in this syndrome and that colitis is a misnomer

THE PATIENT

Irritable colon syndrome is the most common of gastrointestinal diseases and to this all can agree It is sometimes said that 40 per cent of patients treated by the gastroenterologic internist have the entity but this seems to be an excessive estimate It is a disease of midd e age primarily althou͏gh onset during early adulthood is not rare and once it has made its appearance it may persist for the rest of the patient s days It is unknown during chi'dhood About three quarters of the patients are women All races seem to be equally susceptib'e It is a general impression that urban populations are more often affected than rural

The emotional and personality a terations which are the cause of irritab e colon syndrome are similar to those encountered in *ulcerative co itis The emotional turmoil is* often kept well submerged by the patient It may take a few interviews to discover it but eventually one finds that the patient s basic prob em is hostility which he is unable to express Tenseness is the result and usually it has been for years although more on the inside than the outside To his friends as well as to himself the patient often is considered to be a relative failure in his efforts He responds in an immature hypersensitive bewildered way He tends to form firm attachments in his insecurity but a peculiar attitude of hostility can usually be found towards the people on whom he depends the most The dependency situations into which he forces himself are therefore always unsatisfactory for him but nevertheless he cannot permit himself to escape them Exaggeration of emotional turmoil is regularly accompanied by increase of his symptoms This may be due to what most people would consider a stressful situation but many times it seems to be just the opposite The patient s definition of a problem situation is not necessarily the same as that of the doctor

MANIFESTATIONS

Although the complaints of the patient with irritable colon syndrome vary considerably the specific problems are concerned mainly with some variety of abdominal discomfort plus altered bowel function Chronicity is the syndrome s main characteristic Intermittent hypogastric pain is common and so is dull persisting left or right lower abdominal aching Seldom is the discomfort severe but its chronicity and recurrent nature may render it disabling Usually the patient has discovered no tricks for obtaining significant re ief Although he tends to loosen constricting clothing during periods of discomfort this does not help much Changes in body posture and physical activity have no effect Defecation sometimes helps a little Often the period following a meal is a time of symptomatic aggravation probab y due to gastrocolic reflex activity The patient is likely to misinterpret this as intolerance to some part of the meal and a snowballing list of foods that cannot be eaten is the result Nausea and anorexia are common during periods of distress

The bowel disturbance may take many forms *It too is a very chronic matter* Usually there is mild diarrhea which has an erratic pattern but there is a tendency for most of the bowel movements to come in the morning Some patients have only constipation but more common than this is unpredictable a'ternation between constipation and diarrhea When stools are formed they often are of narrow caliber due to hypertonicity of the distal rectum and anus Constipation which is persistent has the characteristics of hypertonic constipation There is no blood

OTHER COMPLICATIONS OF DIVERTICULOSIS

Aside from diverticulitis and the complications which it in turn may cause diverticulosis rarely creates problems There is no predisposition to cancer although when cancer of the colon develops it has a good statistical chance of picking a colon with diverticulosis Almost always diverticulosis is the wrong explanation for bleeding from the bowel whether it is occult or overt About one third of patients with diverticulosis are found from time to time to have blood in their stools but thorough study and a great deal of thought must be exercised before it can be concluded that the diverticula are the source

On the other hand diverticula are capable of causing severe hemorrhage under rare circumstances A sac may undergo inversion and hanging in the lumen as a hollow polyp become eroded and bleed An infected diverticulum may erode into a large artery or vein and quick exsanguination may be the result The iliac vessels are most vulnerable to this mishap Emergency surgical help is required on rare occasions Because of the mass of inflammatory reaction which is ordinarily encountered the technical problem may be very difficult for the surgeon Following resection of the bleeding mass it may be impossible for the pathologist to find the specific bleeding site

MELANOSIS COLI

This condition characterized by blackness of the colon mucosa is of no importance to the patient but it is of unique medical interest because of the startling appearance it produces in the large bowel mucosa as viewed sigmoidoscopically and at autopsy It is found only in people with chronic constipation and only in those who have been in the habit of using anthracene laxatives mainly cascara The patients are found to be habituated to the use of such preparations The pigmentation can be ascribed with assurance to the anthracenes and it usually disappears in time following their discontinuation Melanosis coli is a rare condition and is rapidly becoming more so coincident with decreased popularity of this type of laxative

Melanosis coli is diagnosed by an unmistakable appearance found upon examination of the rectal and sigmoidal mucosa There is pigmentation everywhere often jet black sometimes brown In the former case the blackness is divided into a coarse mosaic pattern by thin straight lines of yellow or gray It looks as though the surface had become hard and cracked but the consistency of the mucosa is found to be normal When the pigment is brown—indicating a less advanced process—it is likely to be spotted with yellow At autopsy the pigmentation is usually found to begin abruptly at the ileocecal valve and to continue to the anal canal with increasing intensity in some cases Biopsy specimens removed at the time of sigmoidoscopy show abundant melanin granules in large mononuclear cells through the lamina propria mucosae

Treatment of the pigmentation is not important It will automatically clear with an unpredictable degree of completeness upon withdrawal of the proprietary anthracene laxative The patient s problem will be severe constipation and perhaps something can be done for this

THE IRRITABLE COLON SYNDROME

Aside from headaches more people seem to react to upset emotions by way of the colon than any other organ The psychiatrists have explanations for this but for the gastroenterologist the proposed quasi Freudian psychodynamics do not prove to be especially helpful in understanding the clinical problems presented Abnormal emotional influence over the colon results in variable alterations in three spheres blood flow or distribution through the bowel wall rate and amount of mucus secretion and rhythm and rate of muscular activity To the patient whose colon is the target area for retained emotional turbulence the problems are largely those of abnormal motility

The clinical result of this functional ab

cept of the hepatic flexure syndrome and the splenic flexure syndrome explains the illness and furnishes a basis for positive understanding of the distress mechanism The flexure syndromes can be characterized as variable uncomfortable sensations experienced by some people when gas accumulates in either or both colon flexures They are very chronic illnesses *Individuals differ considerably in* their response to gas distention in these two locations Probably most are not disturbed by it and the mere presence of a large amount of gas constitutes in itself neither physiologic *abnormality nor clinical illness*

The hepatic and splenic flexure syndromes are not variants of the irritable bowel syndrome and they must not be thought of in the same category The type of patient affected the nature of the complaints and probably the colon dyskinesia at fault differ significantly The flexure syndromes do not *produce colon symptoms* per se There is none but coincidental disturbance of defecatory function To the patient and at the start to the clinician the complaints do not seem to have any connection with the bowel Instead they usually point either to gallbladder disease or to heart disease Often it is found that over the years the patient has had medical surveys of the heart gallbladder liver esophagus and stomach kidneys and spine A thick file of x ray films is one of the stigmas of the *flexure syndrome patient*

The clinical significance of the flexure syndromes is a positive one There is too the important negative aspect which is created by any differential diagnostic problem and it is here that only native clinical acumen plus appreciation of the potentialities of colon sensations can help the clinician The danger is that the diagnosis may leave him uneasy over the possibility of underlying organic disease particularly in the heart or gallbladder There can be little question that misinterpretation will continue to lead to cholecystectomy to enforced cardiac regimes and to laparotomy for possible pancreatic carcinoma and other diseases in some cases This is a tragedy born out of honest thinking and sincere endeavor But the colon with its flexure and other functional syndromes is probably responsible for most misdirected surgical attacks on the abdomen and the gastroenterologist must respect its symptomatic potentialities

THE PATIENT

There is no sex preference Latins and certain oriental groups seem particularly susceptible and American Caucasians only a little less so Although Negroes frequently have excess colon gas it does not seem to bother them Most patients begin to have symptoms when they reach midadulthood When the syndrome is encountered in elderly people the history of years of discomfort is commonly obtained

The personality and emotional make up of these patients form a striking pattern They are not at all like irritable bowel patients but more reminiscent of ulcer patients There is excessive self confidence hostility and general tension without overt nervousness Often there is a degree of cynicism Search for security does not include establishment of deep-rooted attachments and separations are not emotionally traumatic The patient is likely to be a drifter in his interests and a practiced skeptic He is easily dissatisfied calculating and argumentative This is commonly shown in his unwillingness to follow prescribed treatment gracefully He will probably open his interview with a new doctor by venting poorly disguised hostility against his previous doctors and their treatment Above all there seems to be an almost conscious effort to miss the point in all communications

MANIFESTATIONS

Splenic flexure syndrome is more common than its hepatic flexure counterpart The chief subjective problem is discomfort which produces the sensation of poorly localized fullness or pressure either in the upper part of the abdomen or in the left lower part of the chest anteriorly There are never cramps Low left anterior chest discomfort with hypogastric referral is particularly common At times

in the stool Mucus is often visible and it may be passed in large amounts The patient commonly misinterprets this as tissue

Physical examination shows that in spite of a long history of illness the patient s general health has not been affected There often *are external signs of autonomic instability* such as hyperhydrosis of the hands and feet and dermatographia Relative postural hypotension can be demonstrated in most patients The cecum is sometimes tender and the descending colon and sigmoid are usually found to be both tender and easily palpable The basal metabolic rate is often below normal although the significance of this is not clear

Sigmoidoscopic appearances may be entirely normal Segmental spasm is common and it is likely to be especially persistent at the rectosigmoid junction An excess of mucus is often found The mucosa itself is normal but upon serial examinations may show simple hyperemia from time to time

Barium enema fluoroscopy shows no pathologic changes although evidence of hyperactivity and irritability is apparent The sigmoid is likely to be especially affected in this way Uniform hypertonic narrowness distally and segmental spasm with increased haustration proximally are the rule

TREATMENT

The patient with irritable colon syndrome is a good subject for interview therapy Results are often most gratifying to all concerned The patient accepts this approach with gratitude as if he has always wanted to talk this way to his doctor but was never given the chance A close attachment with *the gastroenterologist is quickly established* At first strong hostility accompanies the dependency and in some cases it seems to continue for months Eventually both dissolve and cure seems to depend on this It is fair to estimate that 10 hours of interview therapy are required for the average patient He tends to terminate treatment gradually and often he returns to request another interview after a month or two of silence

If meanwhile symptomatic help is needed nothing is quite as effective as dextrose agar psyllium agar or some other hydrophilic preparation For both the patient with diarrhea and the one with constipation this type of medication tends to bring bowel function *back toward normal The autonomic drugs* are generally not helpful and sedation is neither useful nor desirable A normal diet is best It is a mistake to limit foods to so-called bland items Within the colon no diet proves any blander than a normal diet So often the patient will have built up a series of supposed poorly tolerated foods that considerable effort must usually be made to expand dietary selection

THE HEPATIC AND SPLENIC FLEXURE SYNDROMES

Gas is normal in the colon—everyone has it in varying amounts at different times—and ordinarily it does no harm Some of it represents swallowed air and some gas generated by the colon flora Plain x ray films of the abdomen regularly show that the colon handles its gas by collecting it in spherical bubbles Gas is never spread diffusely through the organ indicating that through haustral activity *the normal tone of the colon muscle* is continuously exerted upon it Gas can cause distention and like other hollow organs the colon responds to distention by creating pain Because distention as a relative matter depends on muscle tone rather than the magnitude of the stretching force even small amounts of gas are able to cause discomfort This type of painful sensation is familiar to all normal people It is due simply to momentary trapping of bubbles by segmental contractions Release with migration of the gas onward can easily be recognized through immediate relief from the minor discomfort plus a sensation of motion *within the* abdomen

A good many patients cared for in gastro*enterologic practice have as their main* problem symptomatic colon gas This simple matter has not received nearly the publicity it deserves In the majority of patients the con

cept of the hepatic flexure syndrome and the splenic flexure syndrome explains the illness and furnishes a basis for positive understanding of the distress mechanism The flexure syndromes can be characterized as variable uncomfortable sensations experienced by some people when gas accumulates in either or both colon flexures They are very chronic illnesses Individuals differ considerably in their response to gas distention in these two locations Probably most are not disturbed by it and the mere presence of a large amount of gas constitutes in itself neither physiologic abnormality nor clinical illness

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there is rather precise radiation to the epigastrium the left flank or the left renal area Sometimes the pain is limited to one of these areas Palpitations are not uncommon and these plus the sensation of pressure within the sciousness He may then recognize some dyspnea Sometimes the discomfort is constant through most of the day being noticed for one or a few hours at a time especially when the patient is not busy In other cases

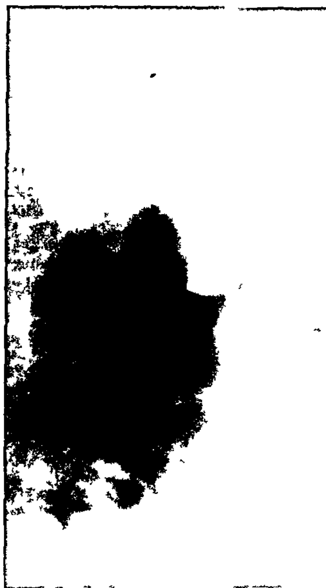


Fig 141 Typical roentgen finding in case of hepatic flexure syndrome The patient had symptoms typical of chronic cholecystitis The cholecystogram is normal

chest often make the patient believe he is having a series of heart attacks He usually feels that if he could only belch he would feel better but he cannot He is likely to take deep breaths in his attempts but this makes his problem worse by adding ventilatory con

the pain comes in a series of frightening attacks lasting only a few or several minut s at a time The patient may have an urge to lie down perhaps from fear although this does not help If he should eat a normal meal he finds this makes the discomfort worse



Fig 142 Characteristic picture in splenic flexure syndrome It is to be understood that the diagnosis is not made radiologically

and quick filling at mealtime is a common complaint The patient does not have excess flatus but a bowel movement accompanied by passage of gas sometimes gives relief It is evident that the splenic flexure syndrome may simulate heart disease

The patient with hepatic flexure syndrome has periodic right upper abdominal pressure discomfort (Fig 141) It at times is moderately severe There is no cramping The patient feels fullness and a fruitless desire to belch Radiation to the back or to the right shoulder is common Radiation across the epigastrium is too but only occasionally does a patient have the classic symptoms of both hepatic and splenic flexure syndromes The

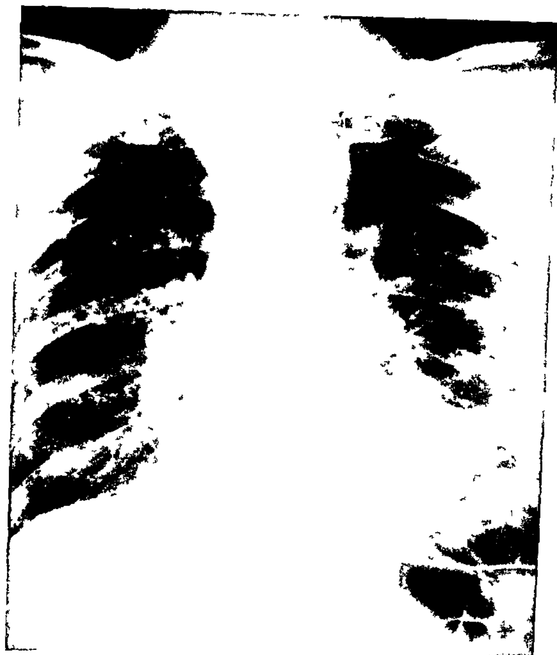


Fig 143 In a patient with splenic flexure syndrone often every routine chest film shows a large bubble of colon gas deforming the magenblase

severity of the discomfort tends to fluctuate considerably The patient feels best when the stomach is empty and sometimes there is actual fear of eating Relief is difficult to find when discomfort is severe although some patients report that they are likely to stretch and change position when they feel badly The hepatic flexure syndrome quite clearly often simulates gallbladder disease

Diagnosis is made largely on the basis of the history supported by demonstration of excess gas in either of the flexures It must be emphasized that mere presence of a large amount of gas is of no importance by itself and does not permit a diagnosis The ga can regularly be demonstrated by percussion during symptomatic periods Occasionally during an especially severe attack the patient reports that his lower left ribs are bulging out and this may in fact be found to be true

Usually all of the x ray films in the patient s possession which include the flexure areas show the large bubbles of gas (Fig 142) There is no excess gas elsewhere in the bowel If the splenic flexure is the site of trouble it almost always lies high in the abdomen often against the diaphragm Routine chest films going back for months or years if such be available show a monotonous series of pictures of big colon gas bubbles deforming the magenblase (Fig 143) In cases of hepatic flexure syndrome a previous gallbladder series is often available and usually the colon gas is found in direct apposition with the organ

Study of the colon by contrast fluoroscopy is normal Proper preparation for radiologic examination temporarily eliminates the gas There may be steeple deformity of the splenic flexure although the gas trap so formed cannot necessarily be considered the basis for the syndrome

TREATMENT

Often the patient with flexure syndrome cannot be given concrete comfort and this is because he tends to be a difficult nonreceptive subject for interview It usually proves to be a mistake to go into a detailed explanation of the mechanism of symptoms with the patient because often it is viewed by him as wholly unacceptable This is especially so if the diagnosis has been suggested only after a long series of studies carried out with an increasing degree of bewilderment on the doctor s part A positive diagnostic attitude is justified and interview therapy should be entered into with confidence on the doctor s part The familiar autonomic drugs which one might suppose would furnish some symptomatic help are useless in almost all cases For reasons unknown it has been found that the long discarded physiologically weak antispasmodic asafoetida gives good symptomatic help in some cases

BACTERIAL AND VIRAL AGENTS AND DISEASES

Except for those bacterial species which are well known as the agents responsible for the colon s classic acute infections the potential pathogenicity of the different members of the bowel flora is poorly known Establishment of the true pathogenic significance of even the most common of the colon bacteria is extraordinarily difficult One can well appreciate that evaluation of colon viruses poses problems which are almost insolvable with currently available virologic technics The mild epidemics of intestinal flu and virus colitis which are so familiar to the clinician and the population in general must remain for the moment an etiologic mystery even though obviously they are of infectious nature Afebrile infectious nonbacterial enterocolitis is a term which is coming into common use to cover brief epidemic diarrheal illnesses which appear clinically to be of viral etiology The poliomyelitis virus is now recognized as an occasional cause of mild enterocolic disorders Similarly several strains of the Coxsackie virus are being isolated more and more frequently in cases of diarrhea and the experts seem to believe there is a specific etiologic association

Bacteriologically a whole spectrum of biologically differing organisms is found among the normal bowel flora Efforts at precise classification have not been very successful because for the most part they have been attempts to force taxonomy on organisms which differ in degree not kind Largely as a result of experience with epidemic diarrhea of neonates it has gradually become apparent that certain components of the normal flora including the *Escherichia coli* group can no longer be considered nonpathogenic Once again the clinician is proving that pathogenicity is not a feature of the parasite but of the host parasite relationship In some people under certain circumstances simple coliform types can cause illness This appears especially true among babies and old people One can no longer classify colon bacteria as either pathogenic or nonpathogenic—they are all in betweens For both clinical and public health purposes this means among other things that determination of an organism s ability to ferment lactose is not a proper technic for

detecting dangerous bacteria In fact it is now realized that there is no secure laboratory method of differentiating pathogens from nonpathogens

Epidemic diarrhea of neonates is the most disastrous of coliform infections Several strains of *E coli* have been incriminated—not difficult sometimes because the babies stools may contain the strain in pure culture Following recovery agglutinating antibodies can often be found in significant titers Epidemics are characterized by a series of exacerbations suggesting cyclic variations in host parasite relationships In planning therapy with Neomycin an excellent agent for the purpose it is important to treat all infants and professional personnel using the nursery in order to eliminate the strain entirely at least for the time being

THE INFLUENCE OF LACTOBACILLI ON COLON SYMPTOMS

There is a very interesting history dealing with the importance of the normal gastrointestinal flora and its balance in maintaining the bowel s normal motor function The matter is not very clear in spite of a great many clinical observations by many competent observers There is general agreement that bacterial equilibrium in the colon is a process governed by many local influences and that it cannot be permanently changed by any artificial means It is also well established that certain lactobacilli when in sufficient quantity are able to exert a favorable influence over some of the simple manifestations of bowel dyskinesia such as diarrhea constipation distention discomfort and excess gas

Sometimes the symptomatic help which is afforded the nonorganic colon cripple by simply adding a large quantity of buttermilk to his diet is astounding and the clinician is doubly impressed if the patient has previously been treated for months with more pretentious drugs and preparations without help The secret of such results seems to lie in the artificial charging of the intestinal flora with *Lactobacillus acidophilus* a normal denizen of the bowel and a prominent constituent of buttermilk The bacterial equilibrium may be influenced in favor of the lactobacilli as long as the gastrointestinal tract is being flooded at short intervals with viable *L acidophilus* Conditions revert to the natural equilibrium as soon as the source of excess lactobacilli is stopped The two problems of attempting this form of bacterial manipulation are that about 100 billion viable organisms must be added to the bowel daily if there is to be any effect and that natural and concentrated preparations containing large numbers of *L acidophilus* are gustatorially repulsive to many people Although the *L acidophilus* count of buttermilk varies considerably from batch to batch a satisfactory clinical response can often be obtained from a quart a day with meals Compressed tablets are available which contain up to 40 billion viable organisms each and this appears to be a good form of prescription

Prescription of buttermilk or lactobacillus concentrate is likely to become common in one s practice once it has been given a short trial It is of course a symptomatic gesture only but as such it is useful for certain patients with organic as well as functional colon complaints Whatever the diagnosis and whatever form specific therapy may take it can be expected to furnish positive help for excess gas functional diarrhea distention and similar secondary functional problems In addition routine addition of large amounts of buttermilk to any regimen which includes Aureomycin Terramycin or other potentially disturbing antimicrobial drug will come close to precluding colon complications

SHIGELLOSIS

Shigellosis or bacillary dysentery is for the most part a disease of primitive societies and of migrants who are forced to live under primitive conditions Nevertheless the infection is encountered throughout the world and sporadic cases and small epidemics are not unusual in the best metropolitan areas Several bacterial species are important human pathogens Although there are no predictable differences in the clinical severity of the in

fection produced types 1 and 2 of *Shigella dysenteriae* generally prove to be the most virulent *S flexneri S sonnei* and *S boydii* usually cause a milder illness but are nevertheless important enough These are gram negative nonmotile nonsporulating nonencapsulated facultatively anaerobic rods Man is the only important host

Shigellosis is believed to be transmitted by food water flies and direct contact Carriers are known to be important in dissemination and overcrowded conditions help The least definite case can be made for water borne infection and it is sometimes said that purification of drinking water is not as important in prophylaxis as is the availability of water for hand washing

The pathologic changes of shigellosis are usually confined to the large bowel and they are most extensive in the rectum The ileum is probably seldom involved The progression of pathologic events can therefore be well studied sigmoidoscopically Pyogenic inflammatory lesions develop quickly over large areas of the mucosa starting with generalized hyperemia and edema excess mucus secretion and intramucosal hemorrhage Necrosis develops over scattered areas of the inflamed engorged mucosa and sloughing quickly leads to ulceration Shigellosis ulcers are usually a few millimeters in diameter sharp of edge but irregular in outline They are superficial and remain so examination of biopsy specimens shows that the muscularis mucosae is not often involved Perforation of the bowel can occur however although it is rare except in some particularly virulent epidemics Healing proceeds by granulation and formation of little scars The infection usually remains in the bowel wall Bacteremia can rarely be proved by blood culture but judging from the clinical picture it must develop at least briefly in many cases

Clinically bacillary dysentery is an acute diarrheic disease of variable severity There is considerable individual variation in susceptibility to infection and it is not uncommon to find that one member of a family becomes acutely ill while another enters immediately into the carrier state It is usually a self limited infection Progression to chronic bacillary dystentery is most unusual The case fatality rate in the United States is about 1 per cent Some epidemics particularly those involving neonates and old people prove to be highly lethal The incubation period probably lasts from one to six days and the average is about two days The clinical illness may pass in a few hours but ordinarily it lasts about a week

Onset is abrupt with hypogastric cramps diarrhea tenesmus and sometimes vomiting There may be 40 bowel movements a day Almost always there is gross pus and usually there is blood in the stools Water and electrolyte loss may be severe leading quickly to clinical acidosis and severe prostration Similarly there may be considerable blood loss High fever chills severe headache and meningismus are common phenomena in some epidemics Nonpurulent conjunctivitis bronchitis and arthralgia are occasional manifestations Acute septic arthritis complicates about 3 per cent of cases The physical findings are those of variable toxicity dehydration and anemia with considerable abdominal tenderness and muscle guarding In some patients the whole illness consists merely of slight diarrhea Upon resolution of the process the signs of toxicity clear first and after a few or several days tenesmus and diarrhea disappear

Sigmoidoscopic examination will ordinarily be carried out when a patient presents himself with this clinical picture Although sigmoidoscopic appearances of themselves do not permit an unequivocal diagnosis of shigellosis the examination is very useful for evaluation of the type and degree of damage and for collection of material for microscopic study and culture The endoscopic picture is as expected from the pathologic changes—hyperemia edema exudate and often ulceration The exudate is highly cellular containing masses of polymorphonuclear pus cells and fewer erythrocytes There are not many mononuclear cells in the exudate

Specific diagnosis depends on culture of

stools and of material obtained at sigmoidoscopy Blind rectal swab technics possess *no special advantages The organism is a delicate one* and the specimens must be handled carefully Through use of routine screening culture technics general bacteriologic identification can be made within a day but more burdensome technics are required for specific type diagnosis Serologic tests are not helpful for clinical purposes

Specific antimicrobial treatment is remarkably effective in eliminating the organism from the bowel but there is much more to treatment than this The patient often requires a good deal of supportive therapy and nursing care for a week or two Simple parenteral fluid and electrolyte replacement is a pressing matter in some patients and a few benefit from blood transfusion For specific therapy a five day course of either Aureomycin or Terramycin proves effective Although stool cultures often become negative by the end of the first day bacteriologic relapse is possible unless the drug is continued for a few days On theoretical grounds it appears that the combination of neomycin and polymyxin may offer the optimum in synergistic antibacterial activity but clinical experience has been sparse So far development of drug resistant strains has posed no problem as it did during World War II following extensive use of the sulfonamides for treatment The patient is a potential source of infection until treatment is well under way making isolation precautions important

ANTIMICROBIAL DRUG DIARRHEA AND ANORECTAL SYNDROME

It is important that these simple drug complications be differentiated carefully from pseudomembranous enterocolitis The latter which may or may not be associated with use of antimicrobial drugs is a far more serious disease of dissimilar etiology The conditions discussed here are important enough from the standpoint of morbidity or simple nuisance but management is not often difficult

The antimicrobial drugs may be responsible for several forms of adverse reaction all well known to the clinician Among the reactions which manifest themselves mostly through the gastrointestinal tract simple nausea and vomiting are most common Possibly there is too a valid gastrointestinal allergy to the antimicrobials although it must be rare In this connection it is well to remember that these drugs are widely used in the management of dairy animals and that commercial milk often contains a slight but allergenically significant amount

Any antimicrobial drug which is antagonistic to constituents of the normal bowel flora necessarily creates a bacteriologic vacuum Organisms which are unaffected by the drug are able through their natural competitive activities to become dominant The natural antagonists of *Pseudomonas* and of the fungi particularly are depressed by antimicrobials Although there are wide variations from colon to colon stool culture after a course of antimicrobial drug often shows there has been overgrowth of *Candida* spp *Pseudomonas* and various cocci Probably as a result of these floral changes a portion of people who take an antimicrobial drug particularly Aureomycin or Terramycin develop diarrhea It has not been proved that either fungi or ascendant bacteria are directly responsible Because the diarrhea is sprue like in some cases there is speculation over actual deficiency especially of vitamin B Some of the normal bowel bacteria of course synthesize vitamins and many fungi consume vitamins in the course of their metabolism Whatever the mechanism there is great variation in patient susceptibility to antimicrobial drug diarrhea The specific drug its dose and its duration of administration seem unrelated to the chances of a patient s developing the complication

When diarrhea develops during antimicrobial therapy it ordinarily does so a week or two after the drug is started In some patients it stops when the drug is discontinued and in others it does not Symptomatically the diarrhea may be very severe even to causing prostration Sometimes there are traces of bright blood and regularly large amounts of

mucus can be recognized Persistence is the main characteristic of the diarrhea It may continue for months after the drug has been stopped It may be responsible for greatly prolonging postoperative hospitalization time or for expensive fruitless colon studies Sigmoidoscopic examination shows a characteristic picture the mucosa is edematous but dull there are large patches of bright hyperemia and both petechiae and small erosions are prominent

In a small proportion of patients the reaction manifests itself not so much by diarrhea but by a complexity of more localized anorectal symptoms This is most likely to affect people of middle age and is rare in children The syndrome usually begins one or two weeks after drug therapy is initiated Pruritus ani is the major problem It may be agonizing Frequently in addition there is anal pain usually of a burning nature It and the pruritis are most troublesome during the day and are aggravated by physical activity and by defecation Bleeding at the time of defecation is usual Examination of the anal canal reveals multiple anal ulcers or fissures Sigmoidoscopically the lower rectal mucosa is found to be hyperemic and eroded In women candidiasis of the vagina and pruritus vulvae are common associated problems Occasionally glossitis and stomatitis too are found

Whether or not alteration in bowel flora is the whole explanation for the complications of antimicrobial therapy clinical experience proves that both prophylaxis and treatment can effectively be implemented in most cases by treating the flora This is best done by flooding the bowel with viable lactobacilli as discussed above Other measures furnish notably ineffective symptomatic help If the patient who is taking Aureomycin Terramycin o other such drug drinks at least a quart of buttermilk a day from the start he will develop no lower bowel complications This is a remarkable example of prophylactic effectiveness If a complication such as diarrhea or anorectal syndrome has already developed a quart of buttermilk a day can be counted upon to furnish important help if not complete suppression of the symptoms One may prefer to prescribe compressed *Lactobacillus* tablets instead of buttermilk The main problem with this treatment is that in some cases it must be continued for a few or several months before the natural processes demonstrate that they are able to maintain the bacterial balance on their own Meanwhile the patient feels well although the chances are good that he does not like buttermilk

GRANULOMATOUS DISEASES

Granulomatous lesions of the large bowel are not particularly common but at times they create difficult diagnostic problems by simulating carcinoma Probably the most common nonspecific form is simple regional enteritis which has extended on into the colon This may cause diagnostic uncertainty unless the small bowel disease is recognized roentgenologically Eleoma and barium granulomas have been mentioned elsewhere Beyond this nonspecific granulomas of the colon like those of many other organs find themselves in an uncertain status

There is a strange pseudogranulomatous or quasi granulomatous disease of the ascending colon which has been considered by some authorities to be a form of regional or segmental ulcerative colitis It acts as a very chronic process with slow caudad extension Its gender is not understood but in its clinical manifestations and histopathologic characteristics it is quite different from classical ulcerative colitis The appellation ulceratve colitis" is unfortunate It may be that *eventually* it will be found propitious to make a distinct category of this disease defining it perhaps as an isolated chronic cicatrizing process of apparent inflammatory nature which histopathologically is characterized by the presence of giant and epithelioid cells in granulomatoid arrangement without caseation This is a rare disease but instances are being reported with regularity

Tuberculosis of the lower gastrointestinal tract is localized to the ileocecal area in most cases This is especially true of the hyperplastic form Elsewhere the ulcerative form is

considerably more common Hyperplastic tuberculosis of the rectum is a rarity *Actinomycosis* too is usually restricted to the ileocecal region Annular lesions of the sigmoid have been reported a few times *Histoplasmosis* may rarely involve the rectum in the form of scattered pseudo polypoid projections a few millimeters in diameter Through the sigmoidoscope they have a spongy appearance and manipulation shows them to be fragile They bleed easily Their accessibility to the biopsy forceps makes histopathologic and cultural diagnosis much easier than it ordinarily is in histoplasmosis

PARASITIC DISEASES

REMARKS ON GASTROINTESTINAL PROTOZOOLOGY

The opportunity is taken in this chapter to present a classification of the gastrointestinal protozoa even though not all are inhabitants of the colon It is best not to separate parasitologic subjects from the rest of gastroenterologic diseases as is sometimes done In clinical gastroenterology the organisms themselves must be made subordinate to the diseases they may cause and the latter shou'd be thought of in terms of the organ primarily affected Much of the impatience with clinical parasitology that one notes among house officers is ascribable to didactic emphasis on the biologic rather than the clinical aspects But both are important and long names and life cycles are as essential to parasitologic dealings as are cultural characteristics to the bacteriologic diseases

The following are the gastrointestinal protozoa of man The pathogenic ones are marked with an asterisk The others are commensals or in some cases possibly symbiotes

- I Rhizopoda
  - A *Endamoeba gingivalis*
  - B *Endamoeba histolytica**
  - C *Endamoeba coli*
  - D *Endolimax nana*
  - E *Dientamoeba fragilis*
  - F *Iodamoeba butschlii*
- II Mastigophora
  - A *Giardia lamblia**
  - B *Trichomonas hominis*
  - C *Chilomastix mesnili*
- III Ciliata
  - A *Balantidium coli**
- IV Sporozoa
  - A *Eimeria gubleri**
  - B *Isospora hominis**

Infection with these organisms is acquired through filth ingestion and the life cycles are rather simple Except for *Endamoeba gingivalis* diagnosis is made by stool examination *E gingivalis* *Dientamoeba fragilis* and *Trichomonas hominis* do not encyst as the rest do and are destroyed by flotation stool concentration technics The intestinal sporozoa are poorly known because human infection is short lived rare and of restricted nosogeography *Blastocystis hominis* is the common yeast like organism of the normal colon which morphologically may superficially simulate the protozoa Giardiasis is discussed in other chapters The protozoa which behave as commensals are of considerable biologic and laboratory interest but because they have no clinical importance they will not be discussed

BALANTIDIASIS

Infection with the huge ciliate *Balantidium coli* has certain clinical and pathologic similarities to that of *Endamoeba histolytica* but it is much less common in this part of the world and it is only incidentally a disease of man *B coli* is primarily a porcine parasite and among swine the host parasite relationship seems usually to be a benign well balanced affair Certain monkeys are the only other known hosts Human cases have been found throughout most of the world but only sporadically in most areas A good portion occur among swineherds slaughter house workers and people who use pig manure on their fields Often however no direct association can be found between the patient and a porcine or another human infection The organism is notably resistant to the elements except for drying and direct sunlight

Infection is acquired through ingestion of

food or drink contaminated by pig or human feces containing the organism s cysts It seems likely that the trophozoites may sometimes also prove infectious for man But man an incidental host is relatively resistant to *B coli* —so much so that attempts to create experimental infection in human volunteers are usually disappointing Upon excystation the trophozoites penetrate the colon mucosa with histolytic and perhaps mechanical destruction *of the mucosa down to the muscularis propria* Irregular undermined ulcers are formed characterized by secondary bacterial infection miliary abscess formation exfoliation of patches of mucosa and sometimes invasion by the parasites into the lymph channels and regional lymph nodes The food vacuoles of the trophozoites contain erythrocytes leukocytes bacteria and assorted crystals Organisms are shed in great numbers in the stools during certain periods but for a day or two at a time the stools may be almost free of them When there is diarrhea the trophozoite stage is expected in the stool and very often the same is true when the stools are formed

As might be expected from the organism s low infectivity powers for man some infections *remain asymptomatic* and many clear spontaneously without treatment In some cases however balantidiasis proves to be a very severe illness occasionally leading to death through fulminating colitis In most the onset is insidious and the course prolonged The clinical picture includes diarrhea which is intermittent abdominal cramps and weight loss Explosive dysentery has been reported but is most unusual Urinary tract infection which is rare and apparently acquired only through perversion is a subclinical process discovered simply by chancing upon the organism during urinalysis Iron deficiency anemia and elevated sedimentation rate are common laboratory findings

Diagnosis is established by finding *B coli* in the stool Because of the erratic way the organisms are passed several stools must be examined before the diagnosis can be excluded Both direct smear and concentration technics should be used For a protozoan this is a big parasite being just visible with the unaided eye when viewed against a dark background Identification under the microscope is easy for the parasitologist Sigmoidoscopically it is occasionally possible to find irregular ulcers and diphtheritic like patches upon a diffusely hyperemic and edematous mucosa Scrapings of such areas regularly show the organism in abundance

Treatment is easily accomplished with *either Aureomycin or Terramycin* Both are specific and cause disappearance of organisms from the stool in about four days A 10 day course of treatment is recommended

PINWORM INFECTION

Enterobius vermicularis is a very common nematode parasite of man There is universal susceptibility to infection (enterobiasis oxyuriasis) and no resistance develops to repeated infection It is believed that about 20 per cent of people in the United States harbor the parasite The incidence is highest among young school children and among adults who live with children It is sometimes found that every individual in a school room or at an orphanage is infected Man is the only known *host*

The worm s cycle is a simple one Infection is acquired by ingestion of the eggs At the time they are shed the eggs are fully embryonated and they are infective at once or within a few hours They hatch in the stomach or small intestine and the larvae then move on down to the colon where they mature and spend their adult life The life cycle requires about two months The males are quickly shed from the bowel following copulation The adult females which are about a centimeter long do not attach themselves to the bowel wall for any length of time but migrate actively about (Fig 144) Rarely do they oviposit within the bowel although they may burst here Instead they migrate out through the anus and oviposit on the perianal area This seems to happen mostly at night for reasons unknown Here the eggs are available to scratching fingers Pinworm eggs saturate the foments of an infested house They travel

with the air currents In any orphanage they may be recovered from picture frames chandeliers window sills etc

It is not common for pinworm infection to cause symptoms Pruritus ani and disturbed sleep develop in a small proportion of infected children Factitious perianal injury of extensive degree may be produced by scratching



Fig 144 Anterior end of female *Enterobius vermicularis* showing two of the three lateral alae at its tip and its long muscular esophagus with its bulbous end

Eggs can rarely be found by stool examination although sometimes adult worms are recognized in the stool Diagnosis is best made by blotting the perianal region with the sticky side of a piece of Scotch tape which is then pressed down on a glass slide and examined directly under the microscope The preparation is best taken early in the morning Artefacts under the tape may take the exact form of pinworm eggs and it is necessary to identify the contained larva before a diagnosis can be made

When pruritus makes treatment desirable one can be sure that ridding the patient of his worms will be easy compared with effective treatment of his house and other surroundings The two best drugs are *p* benzylphenyl carbamate and piperazine citrate For adults the former is given in a dose of 0 5 gm twice daily for two weeks The infant dose is a quarter of this Piperazine citrate an equally effective drug is also given for two weeks The adult dose is 1 gm twice daily All people in the household must be treated at the same time whether or not eggs are recovered from each Housecleaning to rid it of at least some of its eggs is a gesture that should be made at the time but one can expect that the children will become infected once again at school within a few months It is not possible to do much more than treat the family clean the house and instruct parents and children about dirty fingers and then to repeat the whole process if someone becomes symptomatic again

CANTHARIASIS

Canthariasis is human infestation with coleopteran (beetle) larvae In this country infants and young children are most often affected The common meal worm *Tenebrio molitor* is the usual offender in this country Dry and precooked cereals which contain the eggs or young larvae are the usual sources of infection The larvae live for a few or several days within the bowel before they are passively carried out with the feces There are no symptoms but discovery of the larvae in the stool may be upsetting Specific identification of the larvae depends on the morphologic features of the creature s spiracular plates No treatment is indicated In India canthariasis is said to constitute an important clinical problem but in this country it is strictly an accidental form of parasitism

AMEBIASIS OF THE COLON

SIGNIFICANCE OF AMEBIASIS IN THE UNITED STATES

Amebiasis is a disease which perhaps more than any other in gastroenterology has been

beset with pedagogic misinformation and misplacement of emphasis It has been the subject of intense study for many years by workers who have not been primarily concerned with the disease as it presents itself to the clinician With emphasis on the biologic approach and scriptive reiteration of many of the rare features there has been artificial overemphasis on enough matters to render amebiasis as it is often described quite different from the way the clinician sees it Amebiasis is important enough but it is not the most important disease of mankind—nor is it the most common nor the most difficult to diagnose nor the most difficult to cure One must beware the amebamaniacs

Something seems to be happening to the biology of infection throughout medicine Throughout the world pneumococci are becoming hard to isolate and hard to type Viruses are replacing bacteria as the common invaders of many parts of the body Syphilis infections are becoming cured spontaneously more and more frequently Amebiasis apparently has not escaped Amebiasis seems to be changing not only as it is encountered among populations which have been exposed suddenly to new and powerful antimicrobial drugs but also to some extent as it is found among those which have been relatively isolated medically Once believed with confidence to be a tissue destroyer wherever it existed *Endamoeba histolytica* now behaves as a commensal in most of its infections Knowledge of native variations in pathogenicity among different strains of *F histolytica* suggests that the reason amebiasis is not the disease it once was is in part to be found in ascendency of less aggressive amebic strains There is surely more to the matter than protozoan variations however because it is known that bacterial action in and around amebic lesions plays a large part in the pathology and symptomatology of the disease

Coincident with the development of better coprologic technics the estimated incidence of amebiasis throughout the world has risen rapidly This probably does not reflect a true increase in incidence If as some experts claim between 10 and 20 per cent of the people of this country harbor *E histolytica* then obviously the parasite must ordinarily be harmless One has but to recall the Chicago World Fair epidemic or to visit any hospital in the tropics to appreciate the thorough destructiveness of some strains or of some strains under certain host parasite relationships But amebiasis as a clinical entity is rare in most parts of the country in spite of its high incidence as an infection

The misfortune of amebiasis as well as of many colon infections which are capable of becoming chronic is that past teachings have led to assumption of cause and effect whenever a person with bowel complaints—or it is said by many a great number of systemic manifestations—is found to harbor *I histolytica* Because stool examinations are made mostly for people with bowel illness it is easy to acquire a false impression of etiologic significance

BIOLOGY AND PATHOLOGY OF INFECTION

Whatever the actual incidence it is certain that a great many people in all parts of the world harbor *E histolytica* Although the incidence increases significantly as one approaches the warmer parts of the world the parasite has been found wherever it has been sought It is a mistake to consider this a tropical infection Often the patient blames his amebiasis on a recent trip to the tropics whereas he probably picked it up in the corner restaurant or his own dining room

This is another filth disease acquired by ingestion of cysts under the various circumstances which permit food and drink to become contaminated with human feces As might be suspected the familial incidence of infection is much higher than the incidence in general although this is not necessarily true for the clinical illness The trophozoite stage is not infective Although some animals can be experimentally infected with amebiasis and although there are occasional reports of natural infections in domestic animals it seems certain that almost all human amebiasis is of human origin There are impressive data to suggest that much amebiasis of

adults has been acquired during childhood This would mean that many infections are carried for many years and that the great majority that make themselves symptomatically apparent exist in subclinical form for a long time before they do It is not known how often infections disappear spontaneously but in some series of patients followed for relatively short periods spontaneous cure has been observed in 5 per cent The true figure is probably much higher

During maturation of the cyst the nucleus divides twice and upon excystation in the region of the ileocolic junction four trophozoites are liberated This is not an obligate tissue parasite and it is believed that in many cases the infection remains an intraluminal one As such the amebae subsist on material in the intestinal contents and never harm the bowel Possibly some dynamic relationship is required with certain intestinal bacteria before tissue invasion can occur Animals which are reared free of bacteria are able to hold a pure inoculated infection of *E histolytica* only a few days and during this time the amebae appear to be harmless Other factors which alter the host parasite relationship are not well understood It may be noted that experimentally infected dogs often lose their infection on a liver diet and die of fulminating amebic colitis on a diet of salmon The reason for believing in relatively impotent infective powers for *E histolytica* quite apart from its ability to cause clinical illness is that close scrutiny of the colon mucosa at autopsy in this country brings to light an incidence of amebic colitis which is extremely low in spite of stool studies which reveal an incidence of infection of from 2 to 20 per cent It is difficult to believe that a few submacroscopic lesions which might escape gross inspection and routine histopathologic sampling of the colon could spawn the large numbers of cysts which often may be concentrated from the stool Again the situation is *different in some* tropical areas and it must be reiterated that a difference in the predominant strains probably is a good part of the explanation for reported discrepancies

When trophozoites invade the mucosa they characteristically find themselves at the muscularis mucosae before they begin to produce significant tissue destruction This can be a truly histolytic ameba and the earliest lesions appear histopathologically as relatively acellular pockets expanding laterally beneath the mucosal surface The submucosa becomes involved in virulent infections and with extension there is undermining of the mucosa and ulcer formation (Fig 145) The muscularis propria usually escapes ex-



Fig 145 Sigmoidoscopic appearance in case of active amebic colitis

tensive damage but acute perforation of the bowel wall has been described several times The pure pathology of amebic colitis is remarkable because of the almost complete absence of inflammatory response to the infection Secondary bacterial infection appears to be common however and this changes the picture of the local tissue response

In a portion of infections such as those acquired in childhood the pathologic process must be an extremely chronic one Furthermore it must be an eminently static process demonstrating a fine balance between host and parasite If the ameba is living in the tissues all this time it is remarkable that by the time infection is discovered there is very little or no gross evidence of mucosal damage

Amebic colitis is largely a right colon disease The cecum and adjacent ascending

colon are most often involved In this country it is the unusual case of amebic colitis which shows frank ulceration or other significant abnormality upon sigmoidoscopic examination For an accurate understanding of the gross pathology nevertheless it is important to study it during life sigmoidoscopically When lesions are found they characteristically take the form of scattered irregular undermined ulcers from one to several millimeters in diameter They are usually filled in with debris and it is not easy to wipe them clean to judge their depth The intervening mucosa is not normal but shows hyperemia and edema There may be considerable clear exudate If secondary bacterial infection is extensive the exudate may appear as copious and opaque as that of ulcerative colitis In the unusual case of progressive amebic colitis the entire colon may become severely diseased with most any degree of acuteness or chronicity The sigmoidoscopic roentgenologic and gross pathologic pictures may in rare cases simulate those of ulcerative colitis very closely (Fig 146)

An ameboma is a specific amebic granuloma which develops in a small proportion of patients with amebic colitis It usually involves the rectum but occasionally is found in the ascending or transverse colon There may be multiple amebomas scattered along the organ The usual configuration is that of a gradually sloping infiltrating intramural mass which infringes on the lumen to a variable extent Partial or complete encirclement of the colon often occurs At the time of discovery most amebomas measure from 2 to perhaps 10 cm in linear extent

Parenteral amebiasis is ordinarily of hematogenous origin Hepatic localization as discussed in the chapter on the liver is by far the most common Except for extension of liver abscess through the diaphragm into the right pleural cavity or into the substance of the right lung involvement of organs other than the liver is in fact rare Occasionally a liver abscess ruptures into the stomach biliary tract small bowel colon or out through the skin of the chest wall In the last instance the skin margins may become directly infected (amebiasis cutis) Metastases to the brain directly to the lung to the bone marrow and elsewhere are well known in some tropical areas but are pathologic curiosities in this country In these various organs the degree of local tissue destruction is characteristically extensive and usually it is progressive

Amebae are passed in the stool in either the trophozoite or cyst stage and their transit time through the colon and the time allowed for dehydration decide which Whether a patient passes cysts or trophozoites is quite unimportant for clinical evaluation although there is a good deal of difference in the danger of the patient s passing the infection on to others To determine whether a patient is passing trophozoites or cysts is to determine whether he is having diarrhea or formed stools Amebae start their trip to the outside as trophozoites They encyst in the fecal stream This takes time and requires a degree of dehydration If the patient is having diarrhea encystment cannot take place The fragile trophozoites must necessarily die quickly constituting a menace to no one If the stool has become formed the amebae are passed in the cyst stage and cysts for a while are infective if they remain under proper meteorologic conditions

CLINICAL ASPECTS

Although some question may remain about the frequency with which *E histolytica* harms the colon mucosa there can be no question but *that in this country it infrequently harms* the patient Experience with severe phases of the infection in tropical areas has led to exaggeration of the clinical significance of infection in other regions The term carrier seems applicable enough for most amebic infections although there has been resistance to the term because in the past it was thought that amebiasis could not exist without colon damage Epidemic amebic colitis is rare in this country these days but when it occurs and when an especially virulent strain is at fault large numbers of people may be



Fig 146 Roentgen appearance in case of severe amebic colitis

come severely ill The usual case is sporadic Susceptibility to infection seems to be rather general All ages and races are affected As a generality it can be said that the older a patient is the more overt his amebiasis is likely to be

Most infections are discovered in people who complain of one or more very common colon symptoms hypogastric cramps periodic aching discomfort in the right lower abdominal quadrant mild hypertonic type of constipation mild periodic diarrhea or excess gas Following successful elimination of the amebic infection the patient usually continues to complain of the same symptoms This is not a posttherapy syndrome but rather an indication that the amebiasis had little to do with the patient s illness

The complaints of the patient with truly symptomatic amebic colitis are those of

chronic ulcerative disease of the colon plus whatever systemic manifestations it may produce The picture may be entirely similar to that of idiopathic ulcerative colitis early and late Diarrhea is the rule and it is the most important symptom The illness may rarely have a fulminating onset and then there is severe dysentery and considerable blood loss Much more often there is merely fluctuating but persistent diarrhea Only small amounts of blood are lost It is not always true that the patient with the most severe diarrhea has the worst colitis but the tendency is in this direction Cramps and tenderness in the colon distribution are common Because tissue destruction may become severe a negative nitrogen balance may eventually develop with weight loss muscle wasting hypoproteinemia and edema Anemia fever and systemic toxicity are not common

Parenteral spread of amebiasis creates a devastating change in the clinical picture Liver abscess amebic hepatitis amebic pleuritis spontaneous hepatobronchial fistula and brain abscess often develop in fact as seemingly new and primary diseases in patients who have had no colon complaints at all When amebic colitis has already been recognized development of parenteral infection makes a new therapeutic problem of the case The patient with supradiaphragmatic extension of a liver abscess may present himself with the picture of either acute or chronic pleurisy or he may suddenly cough out a great quantity of pus Brain abscess presents no clinical peculiarities which would permit differentiation from any other actively expanding intracranial mass The same is true in metastatic abscess elsewhere Amebomas of the colon are found by abdominal palpation or are discovered by surprise during colon fluoroscopy They usually do not cause important obstructive manifestations

OBJECTIVE DIAGNOSIS

Diagnosis of amebiasis wherever it occurs depends on identification of *E histolytica* in either its cyst or trophozoite stage Although it is true that in occasional patients demonstration of *E histolytica* in the stools is difficult it is a serious misconception to believe that amebiasis of the colon is ordinarily a difficult disease to diagnose The coprologic technics by which this is done have already been discussed The history of efforts to perfect serologic tests for amebiasis is of practical and theoretical interest but at the moment serologic tests offer the clinician no information which is reliable enough to help with diagnosis They are often right but too often wrong Culture of feces for *E histolytica* is not useful in clinical work either although it is an important technic for certain biologic studies There are many technical difficulties and the results are erratically unpredictable It is a matter of considerable importance that *E histolytica* cannot be propagated in pure culture either bacterial or flagellate growth being required in the culture tube if *E histolytica* is to survive

Identification of the amebic nature of the material which is drawn from a liver abscess or pleural cavity or which is obtained in the sputum depends on recognition of its distinctive color and consistency as described under liver abscess Detection of amebae in such material is rarely possible because the organisms are at work in the intact tissue surrounding the abscess not within the cavity itself

Routine laboratory studies are not helpful for diagnosis There is no eosinophilia Mild leukocytosis may develop when extensive amebic colitis becomes secondarily infected When an ameboma develops leukocytosis and an elevated sedimentation rate are to be expected Study of the circulating proteins hemoglobin level liver function tests etc are of course important for evaluation of the whole illness

Both sigmoidoscopic and roentgenologic investigation are important whenever the diagnosis of amebic colitis is entertained The patient s complaints have led to detection of *E histolytica* but more positive information than this is required to prove cause and effect Even moderate experience

with amebiasis is likely to have included a few cases which proved upon routine bowel study to be complicated by carcinoma of the rectum or colon Although sigmoidoscopic examination of patients with amebiasis in this country is not likely to reveal specific changes the study must be made in order to exclude more important disease The same is true of barium enema fluoroscopy Unless there is outspoken colitis the radiologist in frequently finds any sign of the amebic in fection other than irritability of the cecum Ameboma may simulate carcinoma but char acteristically it produces an area of gradual narrowing of the colon rather than an apple core defect

TREATMENT

A patient should not be given specific treatment for amebic colitis unless the specific organism can be found in the feces A trial of treatment as a diagnostic maneuver is well nigh inexcusable for the patient whose bowel symptoms are not understood The problems which are created by such ac tion can be much more harmful for the patient than any amebic infection which may have remained undetected Once a pa tient has been told on insufficient grounds that he has amebiasis it will be very difficult to correct the error especially if the original shaky diagnosis was made only after long clinical study Often the real reason for the patient s symptoms is irritable colon what ever the amebic status may seem to be The nervous patient carries the diagnosis from doctor to doctor and treatment may be represcribed over and over on the assump tion that each previous course has been in effective in eliminating the infection If the patient chooses to insist on more treat ment after an adequate course has failed to improve his symptoms it becomes almost impossible to make an approach to his emo tional problem and to furnish him with solid help

A great many drugs have been devised for the treatment of amebic colitis and phar macologic efforts in this direction are very active at the present time There are three points to remember in attempting to evaluate one s clinical experience in treating this parasite the patient develops no effective immunity against immediate reinfection and he has already demonstrated his susceptibility a portion of infections clear spontaneously without treatment and following treatment it is necessary to find negative stools over a period of several weeks if persisting infe tion which has merely been obtunded by treatment is to be detected

In making clinical u e of the various prep arations one gets the impression that what ever the many reports seem to show about relative effectiveness all the generally ac cepted drugs give about the same results Amebic infection is eliminated by the first recommended course of treatment in about one third of patients Claims for effectiveness of various drugs run much higher than this and it is easy for the clinician to become dis couraged until experience shows him that this is to be expected

Probably at this time Terramycin is as good a drug as any for routine use in treat ing amebic colitis It does not need to be sup plemented by any other drug but in order to prevent drug proctitis and other bowel complications it is necessary that the patient drink at least a quart of buttermilk or take compressed lactobacillus tablets daily during treatment The daily dose for the adult is 2 gm and the course should extend over at least two weeks As stated there are other useful drugs which may be substituted for Terramycin and more appear almost daily Ideally investigation of the results of treat ment should consist of the examination of three stools each at the end of two four and six weeks Failure to find amebae in the nine stools permits assumption of eradication of the infection if not cure of the patient

Amebomas ordinarily disappear within about two months of successful treatment Often it must be realistically added an ameboma will already have been resected be cau e of doubt over the significance of its radiologic picture Amebiasis of organs other

than the colon is treated in general according to the principles suggested for treatment of liver abscess Naturally cerebral amebiasis is accurately diagnosed only at or following craniotomy and special neurosurgical measures will be required

ULCERATIVE COLITIS

The chronic idiopathic form of ulcerative colitis ordinarily known simply as ulcerative

whole ulcerative colitis patients are not quite as badly off as they at first appear Although too ulcerative colitis consumes a considerable portion of the gastroenterologist s time and thought for proper perspective of clinical medicine as a whole it is well to keep in mind that this is an uncommon disease

In ulcerative colitis more than any other gastroenterologic disease there often seems

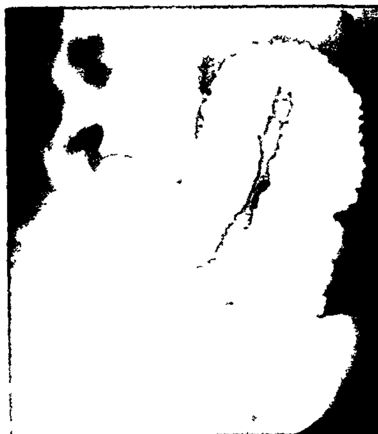


Fig 147 Roentgen appearance of active ulcerative colitis

colitis is a chronic sporadic general body disease which in spite of a common basic pattern of chronicity and a tendency toward recurrence is a process with notable variabilities One of the most striking is simply that of clinical seriousness and in this connection it is important to remember that many of the reports in the literature reflect the conditions observed in hospitalized patients—the more seriously ill—and that taken as a

to be little relationship between the objective data and the whole patient illness It is not possible to reconstruct the clinical picture from a patient s objective studies nor to predict the latter from observing the patient Often it seems that the doctor must be measuring the wrong things when he makes the usual colon studies in his ulcerative colitis patient Possibly the big gap between the objective and subjective is best filled by that

most elusive of all medical influences the patient s motivation

LTIOLOGIC SPECULATIONS

Etiologically ulcerative colitis has been a puzzle with too many solutions This has been good because although the problem of etiology has not yet been worked out to everyone s satisfaction the many theories have led to important serendibitous observa tions on colon bacteriology allergic reac tions diffuse collagen derangements vascular responses autonomic influences and really all phases of large bowel physiology and pathology As is usually the case for etiologic understanding it is necessary to take the hints furnished by both the clinical reactions of the patient as a whole being and the histopathologic picture at the site of chief anatomic change

Ulcerative colitis is a disease of a par ticular personality type and in addition peo ple who develop the disease display some unique emotional responses These are the most striking and perhaps most constant features of the disease Knowing nothing of the results of objective study one can more accurately pick out possible ulcerative colitis candidates than other gastrointestinal categories from a group of patients This is not effect because the personality devia tion antedates often for many years the onset of the colitis That it is part of cause is probable It comes as no surprise to find that ulcerative colitis is a disease of man only and that it cannot be transmitted No epidemic has ever been reported There can be little question but that emotional ill ness or disturbance is a prerequisite One of the important physiologic phenomena which accompany altered emotional responses is abnormal or abnormally intense visceral neurovascular reactions

Switching to the anatomic side of ulcera tive colitis it is found that the most char acteristic feature of the histopathologic change is its superficiality in spite of its chronicity This is a disease of the mucosa and rela tively little else In the great majority of cases it is as though some anatomic barrier is at work in the submucosa to prevent spread of the destructive process into the deeper tissues Thus there is severe or utter destruc tion of the mucosa but beneath a rather healthy submucosa muscularis propria and serosa are found The only plausible anatomic influence which might explain this differential tissue destruction is the same as that which operates throughout the body—tissue hy poxia It is tempting to speculate that sub mucosal arteriovenous shunts or some other normally occurring vascular arrangement is directly responsible through unphysiologic activity for mucosal hypoxia which might explain ulcerative colitis The native bacterial flora no doubt can secondarily invade devital ized mucosa add to the picture of inflam mation and perhaps play a part in assisting dissolution of the glandular mucosa

Emotional control over the vascular mech anisms within the mucosa of the colon and rectum is well known through direct ob- servations of mucosal color Thus both through the sigmoidoscope and at a colostomy one finds that purposefully induced anger or resentment elicit a flush of mucosal en gorgement sometimes with formation of in tramucosal hemorrhages which are secondary to capillary hyperdistention and stasis In addition there is muscular hyperactivity and quick secretion of thick mucus The ques tion arises as to whether people of a certain personality type may in response to chron ically curbed emotional stimulation develop alterations in mucosal blood distribution suf ficient to produce ulcerative colitis

PATHOLOGY

In more than 90 per cent of cases ulcera tive colitis begins in the distal rectum and then progresses for a variable distance in the orad direction Because by the time most patients are first examined the pathologic process has already involved a considerable extent of rectum and colon it is not always possible to prove this In a small portion of cases it is found initially that only the rectal ampulla is diseased and then the

orad progression can be observed by serial sigmoidoscopic and roentgenologic examinations At any rate whatever the total extent of involvement the entire rectum and adjacent sigmoid are eventually diseased in all but about 4 per cent of patients Those who make up the 4 per cent have ulcerative colitis of variable portions of the rest of the colon In rare cases there are skip areas When the disease begins in the right colon it may either remain here or eventually spread by continuity or by skip to the rest



Fig 148 Sigmoidoscopic appearance in active ulcerative colitis

of the organ In about 1 5 per cent of all patients the disease remains restricted to the right colon Ulcerative colitis is an entirely distinct process from regional enteritis in almost all spheres but just as the latter may extend into the colon ulcerative colitis may progress orad beyond the ileocecal valve This has occurred in about one third of the patients by the time of death

The gross pathologic changes are limited almost entirely to the mucosal surface It may be very difficult or impossible to tell that there is severe ulcerative colitis or any other disease by inspecting the exterior of the colon at laparotomy There may be some hyperemia or spasticity only This is a particularly important point of course if surgical therapy is being planned When the colon is opened and the mucosa inspected it is found that the disease is diffuse and that everywhere it is in the same stage of progress Early there are innumerable tiny ulcers close to submacroscopic in size scattered over a diffusely inflamed and congested mucosa From the surface large amounts of purulent material exudes There is a tendency for the ulcers to become ovoid or linear in outline and in time they enlarge through coalescence The remaining mucosa becomes bright red and edematous Progressive enlargement of the ulcers may eventually lead to complete denudation of the mucosa but more often scattered islands of mucosa remain If these stand up prominently from the bare submucosa and if they are swollen by congestion and edema they become known to roentgenologist and pathologist as pseudopolyps

Histopathologically too the disease is found to be confined almost entirely to the mucosa and immediately subjacent submucosa The muscularis propria serosa and mesentery remain normal and at the most the regional lymph nodes show mild hyperplasticity and perhaps a little inflammation The first change in the mucosa is collection of polymorphonuclear cells about the gland termini with formation of focal abscesses These rupture along the mucosa with exfoliation of tiny patches of surface tissue With further undermining the ulcers become joined with more extensive sloughing of the mucosa Meanwhile the blood vessels at the base of the mucosa which have been dilated apparently as a result of local circulatory stasis begin to show mural necrosis and widespread thrombosis may then develop The mucosa becomes heavily infiltrated by both acute and chronic inflammatory cells concentrated at the edges of the erosions Efforts at repair are reflected mostly in fibrosis through the base of the mucosa Evidence of mucosal regeneration may be marked in some cases There is nothing to suggest any tendency toward granuloma formation The cellular content of the myenteric ganglia increases so that through the involved portion of the colon the ganglia may eventually triple their number of ganglion cells Within the colon lumen no new bacteria

or unusual species dominance develops but the proportion of viable organisms greatly increases

THE ULCERATIVE COLITIS PATIENT

The patient is as likely to be a man as a woman The mean age at time of onset of symptoms is about 30 years The disease is extremely rare in neonates and the ulcerative colitis occasionally reported in infants may be a different disease Childhood ulcerative colitis is not rare however and perhaps 3 per cent of all cases appear between *the ages of 6 and 12 years Although three* quarters of the patients are in the third or fourth decade at the time of onset another 3 per cent do not become sick until the age of 65 years has been passed The patient may be of any race or nationality although there is a greater than expected incidence among Jewish people and a very low incidence among Negroes The familial incidence is negligible not more than 3 per cent of patients knowing of a relative with the disease A high level of intelligence is usual Although there recently has been some disagreement on the point it has been the experience of most observers that duodenal ulcer and ulcerative colitis rarely coexist a point of importance in considering the difference in personality patterns and emotional responses usually noted in the *two illnesses Possibly wide use of steroid* hormone therapy for ulcerative colitis might increase the incidence of ulcer

The personality and emotional characteristics which brand the ulcerative colitis patient are almost always recognizable when the patient is first interviewed These are patients with complex neuroses They are not overt psychoneurotics of the complaining variety and the neuroses of themselves seldom create a symptomatic problem Hostility is a major characteristic of the picture but it is usually well submerged under an exterior of submissiveness Similarly the omnipresent tension and anxiety may be difficult to detect More overt are sensitivity and even aestheticism chronic depression passivity emotional immaturity inability to assert himself thorough dependency indecision and conscientiousness carried to the state of perfectionism

One cannot care for many ulcerative colitis patients without becoming impressed with the importance of Mother to the patient and to his illness Sometimes it is a mother figure as wife or older sister but usually it is the mother herself even in the case of the elderly patient Often the father is either ineffectual inattentive or excessively tough There is almost always some abnormal *psychodynamic process going on in the mother* of an ulcerative colitis patient and with few exceptions it is focused on only one of her children usually the youngest and next most frequently the eldest An extreme degree of dependency is forced upon the prospective patient and with it there develop restricted relationships with other people including the siblings Failure to achieve full heterosexual development is a natural consequence The complete submission of the patient to his mother is often startling Even the older patient relies on his mother to make arrangements for his medical care it is often the mother who pushes the patient s stretcher to the ward when he is being hospitalized she furnishes the history and often wants to help with the physical examination and throughout the period of medical supervision *she receives steady reports from* the patient and is likely to demand frequent evaluations from the doctor It is sometimes found that even older professional people with ulcerative colitis write a full account of their bowel movements and *description of each* for their mothers daily

To both patient and mother the relationship appears to be the most wholesome there could be and both are likely to take pride in it the mother with the belief that she *is exhibiting* the best in maternal care and the patient with frequent claims that he has the best Mom in the world But this is the most vicious type of Momism there is and the final common anatomic pathway of ulcerative colitis genesis appears to be ac

tivated in part through the patient's submerged hostility towards his mother. This hostility seems to be the basis of the problem. Any situation which may represent to the patient the threat of permanent interruption in this key relationship is likely to be taken hard by his soma. If the mother or person who has assumed the mother figure should die, the patient who has gained no insight into the significance of the relationship may have a severe relapse. If, on the other hand, the patient has benefited from therapy which has included psychotherapy, death of the mother is often accompanied by dramatic remission of the colitis. Whatever the thoughts or understandings of the patient, simple spacial separations from the mother are likely to be attended by clinical improvement. Thus, a relapse which may be occasioned when the mother visits a married ulcerative colitis patient is likely to subside when she leaves. Similarly, among troops who are on overseas assignment ulcerative colitis is found to be an extremely rare problem. A somewhat comparable release effect with inactivation of somatic manifestations is almost always observed if the patient should become psychotic.

CLINICAL PICTURE

The precise pathologic conditions which exist at the time of clinical onset of ulcerative colitis are difficult to determine. Study when the patient first seeks help frequently shows that an extensive area of the rectum and colon has already become diseased. It is known that the mucosa breaks down quickly at the outset in some cases. Any one of a great variety of psychogenic circumstances may be discovered as possible explanations for the initial break through of the illness, although after detecting such a circumstance one usually must be content with speculation over the possibility of a simple chronologic happenstance. The same is true with organic events which may exist at the onset. At the time the colitis becomes apparent the patient is often in some suggestive clinical situation—the recovery phase of a common infectious disease, the postpartum state, immediate postoperative state, convalescent period following acute infectious diarrhea, following severe purgation, etc. The colon may have been normal prior to onset, or a pre-existing abnormality, such as Hirschsprung's disease, may have led to focus on the colon years previously.

Characteristically the patient becomes sick over a period of a few weeks, with several days of benign diarrhea and mild cramps followed by several days or weeks of relief and then exacerbation with more diarrhea and severe pain. Shortly blood appears in the stools, the diarrhea becomes continuous and the patient shows systemic signs of important illness. Usually the course then settles down to chronic diarrhea with periodic hematochezia. There are 2 to 20 bowel movements a day, and most occur in the morning. Nocturnal diarrhea is unusual. Cramping abdominal pain and rectal tenesmus are very common through the first several months of illness, but then both tend to become obtunded. Fever of some degree is present from time to time. It is irregular, at times reaching high levels. Anorexia and weakness appear shortly after the onset. Rapid loss of weight and protein deficiency are to be expected. Hypokalemia may become a problem when severe diarrhea is associated with poor food intake.

In about 5 per cent of patients the clinical onset is dramatically sudden, with severe fulminating diarrhea, often massive hemorrhage, high fever, prostration and sometimes death within several days from exsanguination.

The course is usually marked by chronicity, periodic fluctuations in the severity of the manifestations, multiple deficiencies and the appearance of a variety of complications. Occasionally the course is benign and brief. The tendency towards spontaneous remission and exacerbation creates a *pitfall* for evaluating the efficacy of therapy. The amount of the disease process in the colon may remain static for months or years, only to extend suddenly with intensification of

all clinical manifestations In its more severe forms ulcerative colitis is marked by profound disturbances of nutrition with cachexia chronic debility and severe anemia A portion of patients become severe invalids dependent on others for all their needs The social and economic problems thus created may be very difficult Approximately 15 per cent of patients who must be hospitalized for their illness die during hospitalization

In cases of right sided ulcerative colitis the clinical picture and course tend to be relatively mild This type is subtle in its onset and sometimes difficult to diagnose even after the process becomes very chronic There is less diarrhea and no tenesmus Fever although common remains mild or moderate In a portion of cases the systemic toxic manifestations are very severe in spite of mild colon symptoms

Bedside physical findings tend to be sparse as far as the colon itself is concerned and *sometimes the patient who is known to have* an extensively diseased colon presents no abnormality upon abdominal examination Usually by far the most striking findings center about the intelligent but dependent apathy of the patient s demeanor the secondary weight loss dehydration avitaminoses protein deficiency and anemia The abdomen is usually diffusely tender When the disease is limited to the ascending colon considerable tenderness is sometimes found localized to the right lower abdominal quadrant There may be dependent edema signs of specific avitaminoses and evidence of one or more complications In about 5 per cent of chronic cases clubbing of the fingers is found The younger patient who has passed through *the age of puberty with his disease regularly* demonstrates sexual infantilism If the child became sick at the age of six examination six years later may show that he has not gained a pound or grown an inch Gynecomastia is occasionally observed in adult males

SPECIFIC FAR REMOVED MANIFESTATIONS

Ulcerative colitis manifests itself mainly through its colon and psychic abnormalities yet it is a disease of the whole body (Fig 149) Because some of the specific parenteral manifestations are inconstant and far removed from the more blatant disease processes they might in a clinical sense be considered complications but pathologically many seem to be a part of the basic problem Discovery of one or more may furnish a clinical tip off regarding the basic diagnosis particularly in occult instances of right sided ulcerative colitis Some may appear before the colon itself shows evidence of disease

Approximately one third of ulcerative colitis patients develop dermatologic manifestations *at some time during their course* Simple oral and circumoral aphthae are commonest Recurrent furunculosis is sometimes a problem Although its appearance is not necessarily *correlated with the activity of the colitis* in the severely ill patient furuncles or open ulcers at times develop regularly at sites of parenteral injection Progression to pyoderma *gangrenosum is rare* but is of particularly serious prognostic import Erythema nodosum common in so many medical conditions develops in perhaps 5 per cent of patients mostly females at some time during the course It tends to be recurrent becoming active when the colitis is active Urticaria and purpura are unusual The skin manifestations of the avitaminoses including pigmentary changes are occasionally encountered

About 10 per cent of patients develop arthritis which has the clinical and roentgen characteristics of rheumatoid arthritis Other patients develop arthralgia *without objective* changes in the joints Sometimes arthritis appears before the colitis and because it has the classical features of rheumatoid arthritis its special significance may escape notice for a while The knees ankles and spine are most often affected Spondylitis may become acutely disabling Less frequently the shoulders elbows and wrists are involved Characteristically the activity of the arthritis varies directly with that of the colitis It is sometimes observed that when colectomy is done early in the course the joint manifestations disappear

Diffuse liver disease is commonly found upon liver biopsy and at autopsy of patients with ulcerative colitis but there may often be reasonable question over the relationship of the two processes When diffuse liver disease is believed to be secondary to colitis the etiologic blame can with some assurance be placed upon nutritional deficiency Although fortunately not a rare one and it necessitates surgical portal decompression under circumstances which are especially difficult

Multiple liver abscesses rarely develop spontaneously in patients with ulcerative colitis although bacterial seeding of the liver via the portal vein must be an active process in this disease The incidence appears to be

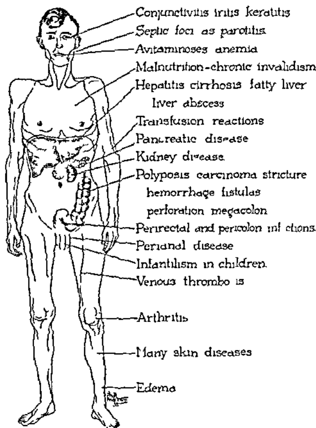


Fig 149 The far removed manifestations and complications of ulcerative colitis

the incidence of coexisting liver disease is about 50 per cent in only about half the cases can it be considered of actual pathologic importance The incidence of clinically important liver disease is much less than this The histopathologic changes are far from specific Simple fatty infiltration is commonest Chronic hepatitis pericholangitis and portal cirrhosis are relatively unusual Development of portal hypertension and esophageal varices creates the most difficult problem It is un-

about 0 5 per cent among patients who are followed for at least 10 years On the other hand development of multiple liver abscesses is not a rare complication of prolonged treatment with cortisone or corticotropin

Other evidences of septic focalization are likewise rare in spite of the fact that bacteremia can often be proved during exacerbations Pylephlebitis is not often the explanation when portal hypertension develops in the patient with ulcerative colitis Thrombophle-

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Fig 150 This roentgenologic picture of severe ulcerative colitis was encountered in a patient who showed only the mildest manifestations of disease a not uncommon discrepancy

Instead they give to the mucosa a peculiar skinned or sandpapered appearance to which are added a thousand tiny points of blood when the end of the instrument is brushed over the surface (Lockhart Mummery sign) As the ulcers coalesce they become recognizable to the unaided eye With the passage of time and development of fibrosis Houston's valves become blunted and contracted and they may eventually all but disappear The rectosigmoidal lumen tends to straighten out and contract The bowel wall becomes firm as it is palpated with the sigmoidoscope the common term woody fibrosis describes the situation well During remission the mucosa itself may return almost to normal or it may



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bitis of the lower extremities and pelvis occasionally becomes a problem Septic parotitis splenic abscess and renal abscess are usually late complications Acute endocarditis has been reported several times in cases of right sided colitis

Mild subclinical kidney injury which does not reveal its presence through abnormal urinalysis can frequently be detected histo pathologically The incidence is approximately 50 per cent The changes are mainly limited to glomerulitis

The pancreas too often shows anatomic evidence of damage at autopsy although clinical pancreatic disease is rarely recog nized Histopathologically chronic interstitial pancreatitis is found

A variety of ocular abnormalities have been described in ulcerative colitis Uveitis and keratitis are the most common and simple conjunctivitis is not excessively rare The severity of all tends to parallel the activity of the bowel disease

Secondary amyloidosis is not a part of the chronic stage of uncomplicated ulcerative colitis It is observed occasionally however in patients who have a chronic suppurative perirectal infection

ULCERATIVE COLITIS AND PREGNANCY

The effect of pregnancy on ulcerative colitis is unpredictable There is much to suggest that the direction in which the pregnant woman s *emotions turn makes the difference* For the most part the emotional make up of the woman who is susceptible to ulcerative colitis does not permit her to view pregnancy with any sort of emotional maturity If she was unprepared for pregnancy and did not want it the colitis is likely to develop early often soon after she learns of her condition This usually proves to be a par ticularly virulent form of ulcerative colitis If ulcerative colitis already exists at the time of conception severe exacerbation is the rule Reactivation under these circumstances is often accompanied by dangerous hemorrhage Occasionally there is abortion or prematurity but there appears to be no added threat of toxemia kidney disease or hyperemesis Often remission occurs during the postpartum period

Pregnancy has a salubrious effect on ulcera tive colitis in a smaller group of women In these patients parturition may be followed by relapse Because it is extremely difficult to identify those who might respond favor ably to pregnancy it is an unusual situation which can justify the advice that pregnancy is not contraindicated in the face of ulcerative colitis

DIAGNOSIS SIGMOIDOSCOPIC AND ROENTGEN OLOGIC ASPECTS

Specific identification of ulcerative colitis depends on the sigmoidoscopic and roentgen ologic findings Evaluation of the disease s extent and detection of certain internal com plications are contingent upon roentgenologic study Both the endoscopic and x ray pictures may vary considerably from patient to pa tient and from time to time during the course of the disease but there is a specific pattern which can be recognized in almost all cases In about 4 per cent of patients as mentioned above the colitis is limited to orad portions of the organ and sigmoidoscopic examination then reveals no specific abnormalities The radiologist is inexplicably unable to detect abnormality in a small proportion of cases when ulcerative colitis is known to be present

During the active phase of the disease *sigmoidoscopic examination shows diffuse* mucosal disease usually to the limit of the instrument s length (Fig 148) The mucosa is swollen and this plus muscular hyper tonicity and easy spasm makes the lumen appear narrow Everywhere there are large amounts of gray exudate mixed with red blood The mucosa beneath is diffusely hyper emic and angry It is very fragile and often there is spontaneous bleeding The initial sigmoidoscopic view may be misleading be cause the nature of the material lying on the mucosal surface may look worse than the mucosa underneath Although there are mul tiple ulcers present they cannot be recognized as such except with the help of magnification



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appear either granular and streaked with gray scars or thin and shiny

Microscopic examination of exudate recovered during sigmoidoscopy reveals masses of pus cells and erythrocytes There are ordinarily so many that it is almost impossible to be sure that no protozoa are present

The extent and nature of the abnormalities which are found upon roentgenologic examination are unpredictable because they are not correlated with the type of clinical onset the duration of symptoms clinical severity of the disease or alterations in the clinical course (Fig 150) Colon motility in ulcerative colitis is marked by diminished haustral activity and increased mass movements The former is demonstrable by barium enema but the latter is not Coincident with loss of haustration there is as probably the cause loss of mural elasticity over the affected areas This inelasticity or stiffening is a characteristic roentgenologic feature of even the rather early case and it cannot all be blamed on fibrosis It leads eventually to the straight uniform characterless lead pipe deformity which often is found upon examination of the sigmoid and descending colon Actual ulceration is not always demonstrable but ordinarily along the barium profile of the actively diseased colon there are areas of spiculation representing numerous tiny ulcer craters Such spicule like extensions from the profile are found in no other disease Later in the course larger ulcers sometimes with undermined edges can be demonstrated Along with these changes there may be the radiologic signs of various local complications as will be mentioned When ulcerative colitis has extended into the ileum the roentgenologic findings are entirely similar to those of regional ileitis with the exception that there is less narrowing of the lumen

In about two thirds of the cases serial roentgenologic studies over long periods fail to show any extension or regression of the process There are however two characteristic changes which accompany aging of the process not to be considered complications One is progressive shortening of the colon

In occasional patients the final picture is that of a narrow uniform tube which swings in a gentle arc from the ileocecal region directly to the anus Another moderately common finding is pseudopolyposis through the diseased areas secondary to hyperplasia and edema of mucosal islands which remain after most of the mucosa has been ulcerated away Sometimes this is discovered upon the initial examination shortly after the patient becomes sick but usually several months pass before pseudopolyposis develops Pseudopolyps appear as filling defects of varying size and configuration sometimes rather angular and often numerous It is especially important that they be recognized as part of the pathologic progression rather than true polyps or cancer

LABORATORY STUDIES

The important contribution of the laboratory in ulcerative colitis is the furnishing of specific information regarding the patient's state of depletion particularly regarding proteins hemoglobin prothrombin and circulating electrolytes Creatorrhea is a fairly regular manifestation of the untreated active case and the clinician may believe it advisable to quantitate this Steatorrhea is an occasional finding but it never leads to an important degree of fat loss Exclusion of infectious agents which are capable of producing colon ulceration is important—ordinarily not a difficult matter In rare instances of amebic colitis the subjective and objective findings may closely simulate ulcerative colitis Stool cultures for specific bacterial enteropathogens and examinations for *Endamoeba histolytica* should be part of the early study of each suspected case of ulcerative colitis The leukocyte count is most variable depending largely on the presence of inflammation outside of the colon

The lysozyme matter is of historic interest but no longer plays a practical part in thinking about the etiology or pathogenesis of ulcerative colitis Lysozyme is a mucolytic enzyme produced by many body tissues Its physiologic substrate is not known although



Fig 151 Chronic ulcerative colitis in 12 year-old boy who had been sick for four years In addition to shortening of the colon and extension of the process far up into the ileum there are high grade strictures at the ileocecal junction ascending colon and transverse colon

it is able to hydrolyze various mucopolysaccharides destroy certain micrococci and inhibit other bacteria It is one of many nonspecific substances elaborated in increased amounts by the body in its reaction to injury In ulcerative colitis the lysozyme titer of the stools reflects the activity but not the cause of the disease The titer increases during the active phase and returns to normal during remissions

COLON COMPLICATIONS

Within and about the colon and rectum a great many important complications may develop The prognosis of ulcerative colitis depends to a large extent on these Some rep

resent pathologically no more than the natural progression of the disease but clinically they must be considered complications because in many cases they necessitate major alterations in therapeutic approach

In its reparative phase ulcerative colitis is a fibrosing process and in addition to shortening of the colon there is regularly some decrease in the caliber of the lumen Stricture formation is common and it becomes of worrisome degree in 10 per cent of all cases (Fig 151) There may be one or several discrete strictures in a colon and rectum which show over all narrowing or less commonly a relatively long segment may be much narrower than the rest of the bowel Common stricture sites are the most distal portion of the rectum the area just below the first valve of Houston the area of the rectosigmoid junction the distal limit of the splenic flexure the proximal limit of the hepatic flexure the cecum as a whole and the ileocecal junction Strictures are not necessarily progressive They may appear rather quickly develop until they cut the diameter of the lumen to one quarter of normal and then become static or even regress a little

It is remarkable how little trouble strictures cause in ulcerative colitis considering their frequency Their potential importance lies in obstruction but obstruction eventuates in only about 2 per cent of all cases Even those which form just above the anal canal are most often silent and obstruction is a curiosity when colitis is limited to the right side of the bowel The danger of obstruction is not so much the block itself but perforation of the diseased colon as it becomes passively distended above the block The thinned wall ruptures very easily when colitis is in the active phase This is not the only mechanism behind perforation which eventually supervenes in about 4 per cent of cases but it is an important one About half of ulcerative colitis deaths are due to peritonitis secondary to perforation In the patient who is severely ill prior to perforation locally contained infection may be difficult to recognize clinically Sudden leukocytosis may be the only evidence of a change in the course Often enough later developments particularly autopsy bring a perforation to light quite unexpectedly

Local penetration with formation of internal fistulas is not nearly the problem in ulcerative colitis that it is in regional enteritis probably because in the former disease bowel damage is limited largely to the inner layer of the wall The incidence is approximately 0 5 per cent The tracts may connect with the small bowel other portions of the colon bladder etc Anorectal fistulas are much more common

The pathologic changes in the bowel wall do not always lead to narrowing In a small portion of cases megacolon develops a very unusual situation among the inflammatory diseases of the colon (Fig 152) It must be recalled of course that the person with Hirschsprung s disease is not immune to ulcerative colitis and the significance of observed dilatation must therefore be evaluated carefully The acquired form which is being discussed here may attain tremendous proportions This may happen interestingly enough even though the organ is considerably shortened and in fact great dilatation may proceed in a colon which formerly was narrowed by fibrosis Acute megacolon is a rare complication of acute fulminating cases Usually in the chronic form the transverse colon is involved often in association with a diminished caliber elsewhere but the whole organ or almost all of it may take part The colon which is so affected is not particularly prone to perforate although this catastrophe is particularly difficult to recognize when there is megacolon For some reason the dilated portion does not retain the barium stream during fluoroscopy and the suspension tends to collect in the narrow segments

The matter of polyposis is a difficult one because of *rapidly changing concepts* Pseudopolyposis as has been mentioned represents a phase in the natural progress of the disease and it is produced when scattered islands of inflamed mucosa are left standing by extensive ulceration This is the most common form of polyposis to be found in



Fig. 152 Megacolon in case of long standing ulcerative colitis As was the case in this patient the dilatation is often confined to the transverse colon and barium suspension passes quickly through the area without lingering There are pseudo polypoid changes in the descending colon

ulcerative colitis In addition true adenomatous polyps may occur in patients with ulcerative colitis either having existed independently prior to the colitis or forming later in the already diseased colon Scattered reports suggest that it it not rare for ulcerative colitis to develop in people with familial polyposis of the colon Histopathologically there is a third type of polyp one which takes the form of a fibro inflammatory hyperplastic tumor of probable regenerative origin but nevertheless of rather uncertain significance

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Probably 20 per cent of all patients eventually develop radiologically demonstrable

polyps of one form or another (Fig 153) Whatever the type their distribution and number vary considerably from case to case Multiple true adenomatous polyposis is very unusual but reactive polyps ordinarily develop in multiple sites over a wide distribution



Fig 153 Pseudopolypoid changes throughout the colon

The danger of malignant degeneration of polyps in ulcerative colitis is a matter of considerable worry for the gastroenterologist People with ulcerative colitis appear to have at least 15 times the chance of developing colon carcinoma as do people without colitis Perhaps the odds are even greater Recorded experiences by many observers indicate that cancer of the colon supervenes in from 1 5 to 10 per cent of patients who are followed for 10 years or longer It may be that not all instances orginate in benign polyps but recognition of the presence of polyps permits a degree of prophylactic action in some cases It is most important to note that pseudopolyps cannot be considered to have malignant potentialities Adenomatous polyps are of course disposed to cancerous change and the same is true of hyperplastic regenerative polyps

When cancer develops it usually does so

between 10 and 15 years after the symptomatic onset of the colitis It affects therefore a younger group of patients than does primary colon cancer Occasionally the patient is still in his teens There is no sex preference The tumors show no special localization tendency and multiple primary carcinomas in different parts of the colon are not rare The early manifestations are the same as those of ulcerative colitis and therefore clinical recognition of the new development may be delayed until late in the course of things Periodic roentgenologic and sigmoidoscopic examinations help in early detection but sometimes not sufficiently to permit effective therapy Furthermore carcinoma which develops under these circumstances characteristically displays a high degree of malignancy Surgical extirpation seldom cures

Uncontrollable hemorrhage complicates about 4 per cent of cases mainly those which begin suddenly and quickly become fulminant Superficial portions of the mucosa over large areas erode away all at once exposing a tremendous vascular bed Exsanguination may follow in short order or when blood replacement is adequate serious bleeding may continue for several days Natural processes seem particularly impotent in controlling hemorrhage when the cause is ulcerative colitis and the clinician has no effective conservative means of stopping it Emergency total colectomy is sometimes necessary

ANORECTAL *COMPLICATIONS*

The rectum is subject to the complications which affect the colon and in addition certain inflammatory diseases about the anus and rectum frequently plague the ulcerative colitis patient Anorectal complications develop in about 25 per cent of the cases and in a small proportion ulcerative colitis first makes itself known immediately after an operation for anorectal disease In all instances of active colitis an operation in this region is attended by unsatisfactory results

Anorectal problems usually begin either with an infected anal fissure or a pararectal abscess secondary to extramural extension of infection Hemorrhoids are often present in these cases but probably they have little to do with propagation of infection Cryptitis is common and is unquestionably important in this regard Although spontaneous remission sometimes proceeds when the colitis becomes inactive anorectal infection can best be characterized as inexorable Perianal and pararectal abscesses spread sinus tracks are formed multiple fistulas result and local tissue damage becomes severe Destruction of the anal sphincter is one possible result and another is internal fistulization connecting with either the vagina or bladder Ischiorectal abscesses may be extremely persistent with periodic discharge both into the rectum and out through the skin Extensive scarring anal incontinence and extension upward into the abdominal cavity are common sequels

TREATMENT

Therapy of ulcerative colitis is best implemented through the gentlest type of psychotherapy by simple interview This proves to be more specific than any other form of treatment It is important to understand that during the active phase of the disease aggressive psychotherapy can lead to disastrous consequences The patient who is permitted to become stirred up during discussions along emotional lines may quickly become severely toxic or suddenly lose a large amount of blood The gastroenterologist must remain more than usually inactive during the interviews He must recognize that ulcerative colitis poses one of the most difficult problems in psychotherapy because of the danger inherent in any approach which is interpreted by the patient as threatening The personality structure of the patient cannot be changed and this is not the purpose Ordinarily at the start a unique type of passive resistance is encountered by the doctor He is likely to encounter frequent breakdowns of rapport and this makes it all the more important that for his part he do nothing to encourage collapse of the conversations through aggression

Whether it will be possible to make any substantial contribution toward the problem

polyps of one form or another (Fig 153) Whatever the type their distribution and number vary considerably *from case to case* Multiple true adenomatous polyposis is very unusual but reactive polyps ordinarily develop in multiple sites over a wide distribution



Fig 153 Pseudopolypoid changes throughout the colon

The danger of *malignant degeneration of* polyps in ulcerative colitis is a matter of considerable worry for the gastroenterologist People with ulcerative colitis appear to have at least 15 times the chance of developing colon carcinoma as do people *without colitis* Perhaps the odds are even greater Recorded experiences by many observers indicate that cancer of the colon supervenes in from 1 5 *to 10* per cent of patients who are followed for 10 years or longer It may be that not all instances orginate in benign *polyps* but recognition of the presence of polyps permits a degree of prophylactic action in some cases *It is most important to note that pseudopolyps* cannot be considered to have malignant potentialities Adenomatous polyps are of course disposed to cancerous change and the same is true of hyperplastic regenerative *polyps*

When cancer develops it usually does so



Fig 154 Extension of ulcerative colitis into terminal ileum in patient with only mild clinical manifestations

Peranal instillations into the colon can be harmful and should never be used

For severely active toxic progressive colitis steroid hormone therapy may prove life saving This is probably the only proper indication for use of the steroids Cortisone appears a bit preferable to corticotropin although there is much disagreement on the point The hormones do not change the over all course of colitis but rather are often able to engineer a dramatic temporary halt to acutely progressive activity with all the features of a speedy spontaneous remission Upon withdrawal whether it be soon or late rapid reversal to the previous state is to be expected About seven days can usually be considered

that the patient s *mother or mother figure* is creating depends of course on the specific situation which is discovered The mother should be interviewed and the ill effects on the patient s illness of certain interpersonal relationship patterns should be explained The urgency of the patient s emancipation must be stressed Almost always the mother seems to understand and to be anxious to help but her subsequent actions usually suggest that she has missed the point The gastroenterologist *often finds that he must work along* with the mother as well as the patient

The spirit of comprehensive gastroenterology is maintained throughout the entire period of observation In particular it is important that the doctor not turn the patient s attention to his bowel by questioning him about its current function It is not very important to the clinician to know a lot about the day to day status of such details as the number and appearance of bowel movements One frequently notices that the patient receives the biggest boost the day that doctors and nurses stop counting his stools recording his daily weight and measuring his daily in*take and output If thereafter he is found* playing poker with other patients on the ward it is no surprise and the doctor can assume his treatment is a success

Concurrently with interview therapy there are many organic matters to be attended to and these require the most careful attention Almost every therapeutic problem to be encountered in internal medicine may arise in ulcerative colitis In planning for supplementation of the several deficiencies which ordinarily exist several points should be kept in mind Most of the patients need food most They should eat a lot and must be fed things they will eat There are no specifications for an optimum diet other than that it must contain the maximum in calories and that it must be of such attractiveness that it will be eaten If there are enough calories there will be enough proteins and other needed elements A positive protein balance can regularly be achieved and maintained if the patient eats enough whatever may be the exact composi*tion of the food materials* Nothing that an ulcerative colitis patient can eat can hurt him In particular there is no virtue in a low residue diet The most practicable plan is to have the patient select what he likes to eat There should be careful subrosa check not of what he selects but of what he eats Early in the course and during acute exacerbations it may be necessary to make supplementation or substitution for oral feedings with parenteral fluids vitamins glucose electro*lytes and amino acids*

Repeated blood transfusions are often remarkably helpful because they furnish the optimum in supplementation and it is a good plan during periods of colitis activity to keep the hemoglobin level right up to normal by this means It is a mistake to neglect even minor degrees of anemia or to expect that the depleted body will make up for the deficiency on its own It is unfortunate that the ulcerative colitis patient often proves to be more than normally susceptible to simple transfusion reactions but rarely does this preclude optimum therapy if antihistamines are added to the recipient blood

Drugs do not have much of a part to play in treatment of uncomplicated ulcerative colitis Antispasmodics and other autonomic drugs are not useful because they are not of *real symptomatic benefit and because there is* nothing to suggest they may improve the basic disease process Opiates have no place except briefly in acute fulminating phases *when they* can provide a degree of relief from severe diarrhea and autotrauma of the bowel The same is true of sedative drugs The danger of drug addiction is so pressing in ulcerative colitis that every effort must be made to indicate to the patient from the start that medicine cannot supply the answer to his problem

Antibacterial agents are useful only for treatment of bacterial complications They do not affect the basic disease in the bowel mucosa Sometimes when such drugs as Aureomycin and Azulfidine are used the colitis seems to become inactivated but most often no positive effect can be demonstrated



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the optimum tide over course considering both the effectiveness and the dangers of the treatment Prolonged use of the steroids should be avoided although repeated short courses may be indicated in cases of severe recurrent hemorrhage

The potential danger of steroid hormone therapy in ulcerative colitis is considerable and the indication for its use must be pressing to justify the risk Complications which have been encountered with significant frequency are multiple liver abscess multiple ulcers of the ileum with perforation giant ulcer of the cecum with hemorrhage perforation of the cecum and various parts of the colon and mental depression leading sometimes to suicide

SURGICAL TREATMENT

Surgical therapy of ulcerative colitis can cure the local colon disease but not the patient s whole disease or often his major problem It is never sufficient by itself It entails a major risk to life and forces a permanent ileostomy on an emotionally sick person The psychologic repercussions are well known On the other hand it alone can save life under certain circumstances and it alone can provide proper management for some of the complications In various reported series it is found that from 10 to 30 per cent of hospitalized ulcerative colitis patients are treated surgically

In this era there is only one type of operation which can be considered adequate when the decision is to treat by radical surgery and this is ileostomy with total colectomy and proctectomy in one stage if conditions permit Except for temporary stopgap procedures which may be necessitated by certain acute emergencies this holds true for treatment of both the colitis itself and for its chronic complications When ileostomy is to be permanent the colon and rectum cannot be permitted to remain Cecostomy and colostomy have no place and temporary ileostomy with the thought that the colon might someday be usab e again indicates poor understanding of the pathologic eventualities

The indications for colectomy must necessarily be relative ones It must be continually borne in mind that operation does not offer the patient a cure but only a way out of some difficult clinical situation It is for this reason that failure of a patient to make progress under prolonged medical therapy cannot of itself be considered a proper indication for operative management The acute indications for colectomy with ileostomy include the rare case of otherwise uncontrollable massive hemorrhage some instances of acute and progressive toxic colitis and perforation of the colon In all of these situations there is a high surgical mortality It is made worse if ileostomy should be done without colectomy As a rule the more desperately ill the patient is the more urgent is the need for simultaneous colectomy Most surgeons are somewhat leery of operating upon an ulcerative colitis patient who has up to that time been receiving cortisone or corticotropin because of healing problems and the masking of postoperative infection It is desirable that several weeks be allowed to elapse between steroid hormone therapy and operation but at times it is the hormone itself which has led to the need for surgery through hemorrhage or perforation

A less precipitous indication for operation is occasionally presented by the patient in whom high fever excessive toxicity and all signs of activity continue with an unremitting downhill course The indication is not failure to respond to medical treatment but realization upon projection of the current course that the patient must otherwise die shortly This is a difficult and controversial indication often complicated by the factors of hormone therapy difficult emotional illness and panic on the part of all concerned

The chronic complications which may necessitate surgical management are carcinoma stricture that actually produces obstruction fistula formation presence of polyps which can be identified roentgenologically as other than pseudopolyps subacute perforation and sometimes extensively destructive anorectal infection Again it must be em

phasized that these are relative indications For instance in most patients strictures never become of clinical importance and the clinician must not be disturbed merely by their presence

The indications for local surgical management of active anorectal complications are almost nonexistent because operation creates more problems than it solves If severe chronic infection about the pelvis and perineal area demands radical action colectomy is the only practical step Otherwise as long as the colitis is active no more than simple incision and drainage of superficial abscesses should be attempted Anorectal complications must be managed in almost all patients simply by antimicrobial drugs and sitz baths and the results are often discouraging After a long remission it is sometimes possible to obtain successful results from such procedures as sphincter repair and excision of an ischiorectal fistula but even such restricted procedures entail a certain risk of activating the colitis and a good risk of poor healing through continued infection The patient with ulcerative colitis whatever its stage does not tolerate anal or perianal surgery well

As lyrical as surgeons are likely to wax over ileostomy for the patient postcolectomy problems are very difficult The evil that ileostomy substitutes for colitis is sometimes less than that of the colitis but not always The mortality rate of ileostomy is high both immediately after operation and during the first few postoperative years About three quarters of patients who die during the postoperative period die of peritonitis and the others of acute enteritis hemorrhage or bowel obstruction Later on it is found that about one third of the survivors require revision of the stoma and in some it seems that a satisfactory ileostoma just cannot be fashioned The skin grafted stoma often proves to be much more satisfactory than the classic type provided that the grafts take and heal well This does not always happen Action of the stoma varies widely being influenced by emotional factors physiologic individualities and dietary variables Most tend to function during and after meals and at night The patient who is able to establish a degree of control does so largely by learning from his own experiences rather than from his doctor s advice The best diet for a patient with an ileostomy is a normal diet and the worst is the concentrated hypertonic dry diet Ileostomy bags of the Koenig Rutzen type which have a ring that is cemented to the skin seem to work best although at that they constitute a major handicap to the pleasure of living An ileostomy is a very permanent arrangement

The patient with an ileostomy is subject to many important complications some of which are predictable and therefore permit prophylactic action Difficulty secondary to faulty salt and water balance is one of these created of course by the physiologic change wrought by removal of the gastrointestinal tract s main absorptive segment This is a special hazard during the hot months of the year when there may be excessive loss of isotonic fluid as well as depression of extracellular sodium concentration through excessive water intake Both the desiccation syndrome and the low sodium syndrome then become threats The patient sometimes rather suddenly becomes lethargic and irritable and may develop hallucinations or he may experience muscle pains followed quickly by peripheral vascular collapse Parenteral salt and water is the treatment but more important is constant attention to prophylaxis Day to day salt intake should be sufficient to cause from 4 to 6 gm of salt excretion per liter of urine

Most mechanical complications of ileostomy present themselves during the first few postoperative months They include volvulus about the stoma small bowel obstruction due to adhesions trans stomal prolapse and very commonly stenosis at the stoma Persistent enteritis sometimes develops postoperatively and this may progress to fistula formation particularly enterocutaneous fistula Occasionally severe hemorrhage is a conquence of enteritis Treatment of these complications is surgical

NONSPECIFIC ULCER OF THE LARGE BOWEL

Nonspecific ulceration *may occur at any* point along the gastrointestinal tract It prob*ably is rare in the colon* but because it comes to clinical attention only by chance or through some complication the incidence is not known There is no sex predilection and all ages are affected It is this type of ulcer which sometimes complicates steroid hormone therapy, and in such cases the clinical facts necessitate assumption of cause *and effect Nonspecific ulcers are solitary* lesions About half of those encountered in the large bowel are cecal and the common site is the medial aspect close to the ileocecal valve The others are scattered although some reports suggest that the sigmoid may *be a favorite site Histopathologically they* give no hint of specific etiology and appearances are much like those of stomach and duodenal ulcers Apparently they may behave as acute subacute or chronic lesions Spontaneous healing probably occurs but little information is available on the natural history Diagnosis does not appear to be possible by roentgenologic means

Perforation is the usual way an ulcer makes its presence known Sometimes it happens after a long course of chronic penetration and pericolic inflammatory reaction so that at emergency laparotomy the surgeon is led to believe he is dealing with perforation of a colon cancer Chronic nonpenetrating cecal ulcers may build up an inflammatory mass about them as they stimulate pericecal reaction and in such cases a syndrome much like recurrent appendicitis may result Hemorrhage is an occasional complication of spontaneously occurring ulcers and it is the main manifestation of those which are associated with cortisone or corticotropin therapy Giant ulcer with hemorrhage is becoming a well known complication of the patient who is being treated with one of the steroid hormones

Treatment is surgical exploration with resection repair or whatever other manipulation seems indicated at the time Because this is usually an emergency move and because the nature of this rare lesion may not be recognizable at operation general surgical *principles can hardly be formulated* When giant ulcer is suspected as the source of hemorrhage during hormone treatment immediate operation with the intent of resection is mandatory because under conservative management the prognosis is very poor

BENIGN MUCOSAL TUMORS

THE POLYPS

The rectum and colon are the most common among gastrointestinal sites for polyp formation Polypoid lesions of one histopathologic type or another are found in about 12 per cent of people who come to sigmoidoscopy and in approximately 12 per cent of those examined by air contrast barium enema fluoroscopy What sigmoidoscopy lacks in reach it makes up by providing optimum visualization The general autopsy incidence is about 10 per cent There may be additional polypoid lesions elsewhere in the gastrointestinal tract and colon polyps sometimes are found as part of the Peutz Jeghers syndrome

It is useful to have a classification of the polypoid lesions which may be encountered at sigmoidoscopy The several types may create considerable endoscopic confusion because *of course polyp is only an expression of* gross configuration and there are many histopathologic possibilities Biopsy is required for precise diagnosis even though the endoscopic impression seems incontroversial

I Nonneoplastic
- A Simple excrescences of normal mucosa
- B Lymph follicle hyperplasia
- C Granulomas (schistosomiasis tuberculosis histoplasmosis etc)
- D Inflammatory (pseudopolyps of ulcerative colitis others)

II Neoplastic
- A Adenomas (isolated multiple familial type)

B Adenomas with malignant transformation
C Carcinomas
D Benign connective tissue tumors
E Sarcomas

In addition to number and histopathologic type polypoid lesions should be categorized for diagnostic purposes according to their size to whether they are sessile or pedunculated and to the presence and degree of ulceration

that the rectal lesions are always discrete and circular in outline In fact people who are found to have rectal lymph follicle hyperplasia almost always show some degree of pharyngeal lymphoid hyperplasia If esophagoscoped they sometimes are found in addition to have similar lesions in the esophageal mucosa There often is relative circulating lymphocytosis This temporary systemic lymphoid disorder seems to have no clinical significance



Fig 155 Biopsy specimen of benign adenomatous polyp removed sigmoidoscopically showing well differentiated mucous glands

The specific types are described here and in other sections A special word is required about lymph follicle hyperplasia In young adults especially during the fall it is common to encounter flattened translucent gray hemispheres a couple of millimeters in diameter scattered through the rectal mucosa When removed by biopsy each is found histopathologically to be composed of a very large lymph follicle lying on the muscularis mucosae partly displacing the mucosal glands The sigmoidoscopic appearance is similar to that of the posterior pharyngeal wall in cases of lymphoid hyperplasia except

ADENOMAS

Adenomas are by far the most common benign tumors of the rectum and colon They dominate to such an extent that the incidence figures for polyps as a whole which are given above apply rather well to adenomas by themselves They are discovered in people of all ages but the incidence is greatest during middle age and beyond About two thirds of the patients are men Negroes are not as often affected as are Caucasians There appears to be no familial influence over the simple type of adenomatosis which is being discussed in this section Adenomas

play a paramount role in the genesis of colon and rectal carcinoma

Histopathologically these are polypoid tumors which are characterized by excessive growth of dedifferentiated mucous glands (Fig 155) Detailed histopathologic subclassification does not serve any practical purpose except as it may apply to early malignant transformation Unfortunately histopathologic interpretation and subclassification may be very difficult In general however the picture is that of a clearly glandular tumor whose epithelial proliferation invades neither the muscularis mucosae the lymphatic channels nor the blood vessels They are true neoplasms without any reactive flavor and the hyperplastic epithelial cells are mature and uniform Those which possess a peduncle have a central core of loose connective tissue often carrying large blood vessels Some adenomas have a papillary or villous configuration—merely a growth variant—and these are made up of independent finger like projections of gland cells with a narrow connective tissue core The villous form tends to occur singly and almost always distal to the rectosigmoid junction and it too is limited to the superficial mucosa

In about half the cases only one adenoma can be found In the others there may be a few or many scattered adenomas Although no portion of the large bowel is immune the incidence decreases as one proceeds upward from the rectum For this reason it is believed that half or more of all adenomas can be reached with the sigmoidoscope and that adenomatosis can be diagnosed sigmoidoscopically in about 80 per cent of affected persons The sigmoid is a favorite site for large isolated pedunculated adenomas

Adenomas may be sessile or pedunculated smooth or villous and benign or malignant Most are only a few millimeters in diameter and are sessile having the configuration of a split pea lying on the mucosal surface The large ones tend to be spherical and these often come equipped with pedicles Those which have a villous surface usually have a broad sessile base and are soft and velvety without fixation (Fig 156)



Fig 156 Multiple benign polypoid adenomas of the sigmoid Surgical specimen

In the majority of cases adenomas produce no symptoms unless some complication should develop They do not cause diarrhea although a good many are discovered through the fortuitous opportunity for sigmoidoscopy presented by the patient with diarrhea Perhaps most are brought to clinical attention because they become eroded and bleed In the sigmoid and proximally obstruction either by obturation or by intussusception occasionally occurs Malignant degeneration is the third means by which adenomas make their presence known

Diagnosis is effected through the com

bined efforts of the sigmoidoscopist and radiologist Endoscopic recognition offers no special difficulties but it must be emphasized a ain that biopsy is required for diagnosis Relatively these are small lesions for roentgenologic detection and the most meticulous air-contrast study is required Sometimes an adenoma has a very long pedicle and it is important that the radiologist find it so that the precise point of origin can be determined

MALIGNANT PROPENSITIES AND TREATMENT

Almost all carcinomas of the rectum and colon probably originate from adenomas or have an adenomatous polypoid form as their earliest stage This is a dogmatic statement to be sure but all authorities seem agreed that it cannot be gainsaid By the time most cancers are examined possible origins cannot be determined There is no way to tell if an adenoma has undergone malignant change except by sectioning and examining microscopically the whole lesion Even then there frequently is disagreement over histopathologic interpretation There is no way either to predict which adenomas might in the future become malignant If an adenoma should be studied sigmoidoscopically at intervals over a long period it is found that its shape and size do not ordinarily change gradually Unless there has already been malignant degeneration it is unusual to note progressive enlargement When new lesions appear they seem to develop almost overnight Similarly previously static adenomas may all at once be noted to have doubled in size It is believed for this reason that development and growth of adenomas go on in spurts and clearly observation of a lesion over a short period can give no information regarding its eventual course

About 5 per cent of sessile adenomas which measure more than 6 mm in diameter show malignant change upon biopsy examination A large proportion of adenomas which are encountered during routine sigmoidoscopy are only 2 or 3 mm in diameter and these almost always are benign Many of the adenomas which are found to have undergone carcinomatous change are those of villous configuration and in fact about one quarter of all villous adenomas prove upon detailed study to be malignant As is the case elsewhere in the body the larger an adenoma is the more likely it is that carcinomatous change has taken place Adenomas do not ordinarily develop a pedicle until they have attained some size and it is therefore no surprise to find that approximately one third of pedunculated adenomas are cancerous There is no area of the colon or rectum which is favored by polyps for the initiation of cancer

In the therapeutic approach to large bowel adenomas it is quite clear that prophylactic aspects deserve first consideration As a general rule it is necessary to proceed with the understanding that all adenomas must be extirpated or destroyed and that an aggressive attitude is justified Often in cases of widespread multiple adenomatosis this necessitates an extensive surgical procedure including proctectomy merely to accomplish adequate prophylaxis Because sometimes no evidence of cancer is to be found in the surgical specimen in such cases and because the anus is physiologically one of the most important parts of a person s body the surgical history of multiple adenomatosis is shot through with efforts to swing the approach along conservative lines When multiple polyposis involves the rectum it is the argument of the aggressive school that only abdominoperineal proctocolectomy can be relied on to prevent subsequent death from cancer of the rectum while the conservatists believe that adequate prophylaxis can safely be assured through coloproctostomy and repeated fulguration of any lesions which may remain or later develop in the rectal stump Figures which show the results of the two approaches are not particularly helpful to the gastroenterolo ist who must make the recommendation of one or the other for a particular patient The truism that the earlier a cancer or precancerous lesion is the more radical the surgical approach must

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sigmoidoscope The sigmoidoscopic picture is that of great numbers of sessile and pedunculated polyps beginning just above the anal canal and extending up as far as visualization can be carried Over large areas



Fig 157 Sigmoidoscopic view of familial polyposis

the lesions may be so numerous that they preclude visualization of normal mucosa In other areas they may be sparse Roentgenologically it is found that polyps extend as far as the ileocecal junction although often they become fewer and smaller as the proximal end of the colon is approached In the majority of cases the entire colon is involved to some extent (Fig 158) It is important to note that at some stage the lesions are very small and then they can be overlooked at fluoroscopy Air-contrast study is necessary

Even though most patients feel well until cancer supervenes the familial aspects of the disease offer a most favorable circumstance for early diagnosis and the inevitable fate without treatment provides the best opportunity to be found in gastroenterologic practice for positive prophylactic action against cancer It is the gastroenterologist s responsibility whenever a case of proved or suspected familial polyposis is encountered to make the patient and available relatives aware of the hereditary aspects and to urge the examination of all Many previously unsuspected cases can be found in this way

Treatment must necessarily be drastic Because it is a prophylactic measure in the optimum case and because the average patient feels well acceptance of recommended therapy comes slow Although the patient may have been impressed by the cancer deaths in his family he has not necessarily been frightened by them and trust in self immunity which is so common among insecure people sometimes deters all efforts to assure proper management

Adequate treatment calls for total colectomy Fashioning of a permanent ileostomy is always required if the distal rectum is involved by polyps or if there is proof or strong suspicion that malignant change has already occurred It is the optimum procedure for all patients Although some surgeons prefer ileoanal anastomosis the incidence of postoperative incontinence is too high to render this operation generally satisfactory If the distal rectum is normal or has only a few adenomas those who prefer

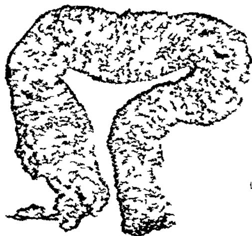


Fig 158 Familial polyposis of the colon Surgical specimen There were no malignant changes

to follow the conservative line may choose ileorectal anastomosis to be followed indefinitely by periodic examination and fulguration of new polyps An important risk is inherent in this choice

be should usually hold sway All will agree that there must be solid prophylactic justification if the anus is to be sacrificed but the conservative approach so often proves later to have been a mistake that an attitude of aggressiveness must ordinarily prevail

For the great majority of patients fortunately no such major decision must be reached It should be noted that solitary and grouped adenomas justify quite a different therapeutic attitude from that for multiple polyposis Mucosal excrescences and tiny sessile adenomas within reach of the sigmoidoscope can be removed *in toto* with the biopsy forceps with electrocoagulation of the base Some fairly large solitary adenomas of the most distal rectum can be managed properly by trans sigmoidoscopic extirpation and fulguration but it will have to be admitted that the danger of unrecognized recurrence as a cancer is just barely overbalanced by the desirability of retaining the anus Solitary and grouped adenomas of the peritonealized portions of the bowel should be removed by segmental colectomy and end to-end repair whatever their size In spite of repeated preoperative roentgenologic study and thorough coloscopy at the time of operation the surgeon often necessarily feels insecure over the possibility that the resected segment has not included all the lesions Colon polyps are notoriously difficult to detect by palpation at operation It should be noted that in children self amputation of pedunculated adenomas is a fairly common phenomenon but this in all probability rarely occurs in adults It might be mentioned parenthetically that people with multiple adenomas of the large bowel seem unusually susceptible to carcinoma of the stomach

FAMILIAL POLYPOSIS OF THE COLON

There is a form of multiple polyposis of the colon quite distinct from the nonfamilial multiple adenomatosis just referred to which is characterized by an overt hereditary nature and a remarkable propensity to undergo carcinomatous transition Familial polyposis of the colon a relatively rare condition is transmitted as a simple mendelian dominant, equally to males and females by either the mother or father In most affected families therefore about half the children develop the disease and behave genetically as heterozygotes Usually it is believed people who are genetically qualified to develop the disease will do so by the time they reach marrying age and can therefore be identified by proper colon studies

The polyps begin to appear in the colon during childhood or early adulthood Although different families may show different tendencies in their symptomatic manifestations in most cases the affected members *remain well until cancer develops* Excess mucus in the stool and episodic hematochezia of mild degree are sometimes noted There may be mild diarrhea but seldom sufficient to lead to medical consultation There are no associated hereditary abnormalities elsewhere and no nutritional problems develop It is rather frequently found that affected people have multiple sebaceous cysts but the significance of the association is cryptic

Carcinoma of the colon is the prospect for the affected members of the family Whether it is correct to say that 100 per cent eventually develop cancer is not certain but if the figure is not 100 per cent it is close to it Commonly multiple foci of cancer develop synchronously through the colon The patient frequently gives the history that many of his forebears have died of bowel cancer at about the age of 40 years but it is an amazing thing that in spite of the family's experience with its calamatous affliction it is unusual to find that prophylactic examinations are faithfully being made

The diagnosis is made sigmoidoscopically (Fig 157) If a person from an affected family has reached the age of 30 years and sigmoidoscopic examination is normal it can be concluded with confidence that he has not inherited the disease In the case of a younger person there is the chance that polyps will develop later If lesions are present some always are in reach of the

might well be considered a routine part of physical examination like otoscopy and vaginal inspection and three quarters of the cancers can be reached with the sigmoidoscope and biopsied on the spot Furthermore as pointed out above because the majority of tumors either originate in adenomatous polyps or have a simple polypoid form as their earliest manifestation the prophylactic possibilities are tremendous

PATHOLOGY

Cancer of the large bowel has much the same distribution as do the benign adenomas



Fig 160 Typical polypoid form of carcinoma of the ascending colon Surgical specimen

Approximately 50 per cent occur in the rectum and 25 per cent in the sigmoid The descending colon and cecum account for about 8 p r cent apiece the ascending colon for 6 per cent and the transverse colon for the remaining 3 per cent These are figures which apply well to most large series There are no sex differences in the favored sites of cancer development

In about 5 per cent of all cases more than one primary carcinoma develops in the large bowel Most of these are synchronous lesions which means that malignant change has taken place in two or more separate areas at about the same time Less commonly an interval of time lapses before the appearance of the second tumor (metachronous cancer) This phenomenon appears to prove that a patient with one cancer is a good subject for another but more important it adds further evidence—which is really not required—to support the proposition that adenomatous polyps are responsible for most large bowel cancer Synchronous lesions are especially common in familial polyposis Associated benign colon polyps are found in about 15 per cent of all cases of large bowel cancer and in about 45 per cent of patients with multiple primary cancers

Women are more likely to develop synchronous and metachronous colon cancer than men which is difficult to explain in view of the sex preferences of adenomas Whenever multiple primary cancers are encountered there must be some question over differentiation between new cancer metastatic cancer and recurrent cancer because the second tumor has the same histopathologic characteristics as the first Various criteria have been proposed to help make the distinction but the matter can be decided only on the basis of the precise conditions found in each case Obviously the practical point is that if there are two lesions they both



Fig 159 Familial polyposis in patient with ulcerative colitis proved by surgical resection

CARCINOMA

Carcinoma of the rectum and colon is potentially the most favorable of gastrointestinal malignancies for early recognition and cure This is a trite statement but as often as it has been repeated mortality figures prove that the potential benefits provided by accessibility are often ignored Considering the sexes together as many people die of cancer of the large bowel as of any other tumor It is second to stomach carcinoma among gastrointestinal malignancies About 14 per cent of all carcinomas of men and 12 per cent of those of women occur in the rectum and colon Routine physical examination includes rectal examination and half of all large bowel cancers can be reached with the finger Sigmoidoscopy

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Fig 160 Typical polypoid form of carcinoma of the ascending colon Surgical specimen

Approximately 50 per cent occur in the rectum and 25 per cent in the sigmoid The descending colon and cecum account for about 8 per cent apiece the ascending colon for 6 per cent and the transverse colon for the remaining 3 per cent These are figures which apply well to most large series *There are no sex differences in the favored sites of cancer development*

In about 5 per cent of all cases more than one primary carcinoma develops in the large bowel Most of these are synchronous lesions which means that malignant change has taken place *in two or more separate areas* at about the same time Less commonly an interval of time lapses before the appearance of the second tumor (metachronous cancer) This phenomenon appears to prove that a patient with one cancer is a good subject *for another but more important it adds* further evidence—which is really not required—to support the proposition that adenomatous polyps are responsible for most large bowel cancer Synchronous lesions are especially common in familial polyposis Associated benign colon polyps are found in about 15 per cent of all cases of large bowel cancer and in about 45 per cent of *patients with multiple primary cancers* Women are more likely to develop synchronous and metachronous colon cancer than men which is difficult to explain in view of the sex preferences of adenomas Whenever multiple primary cancers are encountered *there must be some question over* differentiation between new cancer metastatic cancer *and recurrent cancer because* the second tumor has the same histopathologic *characteristics as the first* Various criteria have been proposed to help make the distinction *but the matter can be decided only* on the basis of the precise conditions found in each case Obviously the practical point is that if there are two lesions they both

must be detected before treatment is undertaken Search cannot stop at one colon cancer

Almost all carcinomas of the large bowel are adenocarcinomas Growth characteristics depend to a large extent on anatomic location In the proximal half of the colon they tend to grow as soft fungating medullary tumors characterized by bulkiness and fragility (Fig 160) The basic gross pattern is polypoid and the main histopathologic feature is simple cellular proliferation In relative terms these are slowly growing tumors Often they metastasize rather late and they show little tendency to obstruct the lumen Superficial bacterial infection is common Rarely do they encircle the bowel although they penetrate the wall freely

Carcinomas of the descending colon tend to encircle as *they grow and thereby* to obstruct (Fig 161) They usually follow a scirrhous growth pattern with prominent deposition of connective tissue which produces flatness and hardness Rarely the picture is that of diffuse hypocellular invasion of a long bowel segment In the sigmoid and rectum carcinoma maintains a soft frankly polypoid form until it is well developed and then becomes progressively sessile and bulky (Fig 162)



Fig 161 Encirclement with partial obstruction of descending colon has already occurred in the case of this small carcinoma

A small proportion of adenocarcinomas of the bowel particularly of the rectum demonstrate gelatinous or colloid degeneration These cancers often become superficially infected and biopsy tissue can be misleading on this account Growth is comparatively rapid and large bulky masses result It is interesting that the clinical course may nevertheless be quite slow

The precise origins of most large bowel carcinomas are difficult to study because by the time of detection considerable local destruction already has occurred Malignant degeneration may take place anywhere within an adenoma It is found in most large series of colon carcinomas that in no more than 0 2 per cent of surgically resected lesions is tumor limited to the mucosa and that the muscularis propria has already been penetrated in about three quarters of the cases A long pedicle seems to offer a degree of insurance against deep invasion as judged by the low recurrence rate following extirpation although it does not necessarily protect against metastasis As the tumor grows its surface expansion keeps up rather well with deeper intramural invasion Horizontal spread is rarely found at the time of operation to have extended more than 2 or 3 cm beyond the gross tumor margin



Fig 162 Carcinomatous change of a large adenomatous polyp of the sigmoid The surgical specimen contained eight polyps in this segment but only one had undergone malignant degeneration

Local complications include bleeding obstruction and bowel perforation Once malignant change has occurred in a polyp the likelihood of intussusception appears to be slight In about 10 per cent of the cases slow local perforation occurs Free perforation can be expected in 2 per cent In spite of spreading peritonitis clinical recognition

must be detected before treatment is under taken Search cannot stop at one colon can cer

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cent—the diagnosis is made when the patient is in the sixth or seventh decade About 85 per cent of patients are more than 40 years old Very rarely the tumor is discovered in a teen ager and occasionally in a patient in the tenth decade The disease is important in all parts of the world and among all races but Negroes seem to be relatively resistant

The patient s health at the time the carcinomatous process begins ordinarily is good Colon adenoma which probably preceded his cancer will have remained entirely subclinical in most cases and he begins his cancer illness as a well man This includes patients with familial polyposis of the colon The predisposing condition which is almost always overt is of course chronic ulcerative colitis The patient in this category is often so chronically ill at the time of carcinomatous change that the new process may not be recognized until very late In some parts of the world visceral schistosomiasis appears to predispose to colon cancer and these patients may already be sick with chronic liver disease and portal hypertension

As a matter of clinical interest it should be noted that there are two physical abnormalities which are commonly found in patients with large bowel cancer Men are likely to have an inguinal hernia There is no way in which one can make a logical connection between this and cancer but the warning is that undue focus on the hernia may delay detection of the less obvious but more important lesion Secondly a large portion of people with colon cancer are found at the time of the initial examination to have hemorrhoids It is likely that tumor growth low in the rectum could be responsible for local venous hypertension but hemorrhoids are also common when the cancer lies far proximally Whether the hemorrhoids are a secondary manifestation or an unrelated phenomenon it can be stated categorically that they more than any other single factor are responsible for delay in diagnosis Colon cancer frequently first manifests itself through hematochezia and it is easy to see how dangerous it may be to ascribe the blood to hemorrhoids short of a complete bowel survey Bleeding hemorrhoids are such common lesions and the pressures of medical economics are so great that one may well wonder what his responsibilities may be in this common almost routine situation Certainly the minimum requirement is digital and sigmoidoscopic examination and in many cases barium enema roentgenography will be considered necessary too

CLINICAL MANIFESTATIONS

In the average case about seven months elapse between onset of symptoms and effort on the patient s part to seek help The delay is about the same for carcinoma of the left colon as it is for that of the right and it is perhaps two months less for carcinoma of the rectum Much depends on whether the patient notices blood in his stools during the period when he is not quite sure whether or not he is sick

The nature of the symptoms depends to a large extent on the location of the tumor Carcinoma of the cecum characteristically remains silent for a long time Occasionally there is a history of vague abdominal discomfort for several months prior to onset of more impressive symptoms but usually there is no warning until the three most common late manifestations appear anemia weight loss and an obvious mass

Cancer of the right side of the colon usually presents one of three syndromes In none is severe pain a prominent feature until late in the course Bowel rhythm is not ordinarily disturbed and constitutional deterioration is a late manifestation Even though the tumor ordinarily has a bulky form the nature of the bowel contents at this level makes obstruction a rare early manifestation First there is the dyspeptic syndrome in which the complaints do not seem to be of colon origin The picture often suggests chronic gallbladder disease Vague right abdominal or right upper quadrant discomfort develops associated with a deep feeling of fullness mild anorexia nausea

of perforation under these circumstances is notoriously difficult Perforation usually oc curs at the site of tumor It is unusual for distended bowel proximal to an obstructing carcinoma to rupture Local sinus formation is relatively common but fistula formation is not Duodenocolic gastrocolic cystocolic and enterocolic fistulas are occasionally en countered

Cancer of the colon like cancer elsewhere is able to become cured spontaneously through sloughing and expulsion Only a few well documented cases have been reported In view of the facts that this is a cancer which originates in a polypoid structure and that self amputation of adenoma is known to occur it is conceivable that spontaneous cure occurs more often than anyone knows

SPREAD AND METASTASIS

Migration of the cancer from its primary site is carried out by direct centrifugal ex tension spread along the perineural spaces peritoneal implantation lymphatic spread and hematogenous metastasis These are well known mechanisms which require little comment but it is worth emphasizing that perineural extension is probably more im portant in carrying tumor to contiguous tis sues than is generally appreciated Whenever spread occurs the lymphatics regularly take part In general the younger the tumor is the more extensively the lymphatics are used as the main route for dissemination Postoperative survival rates are closely corre lated with the degree of node involvement Even though the right side of the colon exclusive of the cecal area normally has a poorer lymph node system than the left carcinomas on the right are just as prone to metastasize to nodes as those on the left

Spread by invasion of contiguous organs and tissues usually remains restricted until the lymphatics are well infiltrated Invasive damage is most likely to be felt by the blad der sacral soft tissues uterus pancreas and duodenum Occasionally the posterior aspect of the stomach s greater curvature is invaded by carcinoma of the splenic flexure pro ducing an x ray picture very much like that of primary gastric carcinoma Formation of sinuses and fistulas may result from this process Carcinoma which extends throu h the serosa may seed itself widely over the peritoneal surfaces

Metastasis to distant organs is largely a portal venous affair and quite naturally the liver is first affected and is the receptacle *for the bulk of extracolic tumor growth* (Table 10) Metastases have developed in

TABLE 10 DISTANT METASTASES FROM CARCINOMA OF THE COLON AND RECTUM 1?0 AUTOPSY CASES EXCLUSIVE OF PATIENTS WHO DIED DURING THE IMMEDIATE POSTOPERATIVE PERIOD

Organ	*No Patients*
(Local extension only	13)
Liver	100
Lungs	52
Kidneys	18
Adrenals	9
Brain	6
Spleen	6
Bone	5
Pancreas	5
Meninges	5
Thyroid	3
Small bowel	2
Myocardium	2

the lungs in about half the patients by the time of death Other sites are relatively un common for hematogenous embolization It is apparent that tumor growth is backed into the systemic venous system in a rather small proportion of cases Invasion of the veins *in the immediate vicinity of the* primary growth is of course one of the important factors in determining postresection prog nosis and in the absence of gross evidence of metastasis it is useful to x ray the surgical specimen following injection of its veins as well as inspecting them grossly and microscopically

THE PATIENT

There is a slight preponderance of men over women among patients with large bowel carcinoma In most cases—perhaps ℓ0 per

ported by about three quarters of people with rectal or sigmoid carcinoma Nevertheless significant anemia is found in no more than 10 per cent at the time of the first examination Half or more complain of pain often poorly localized in the lower portion of the abdomen or the pelvis It may be either dull and constant or crampy Backache is moderately common As times goes on the familiar systemic effects of progressive malignant growth are felt—fever weight loss weakness etc

Examination of the patient s abdomen is frequently disappointing A mass can be palpated at the time of initial study in about 50 per cent of patients who have cancer of *the cecum or ascending colon* but in only about 10 per cent of those with cancer of the descending colon or sigmoid Laboratory study gives little diagnostic help although it is invaluable for evaluation of the patient s general status Chemical melena iron-deficiency anemia depressed serum iron hypoproteinemia and rarely eosinophilia may be found It is interesting that often the most profound anemia is associated with the lowest grades of malignancy

DIAGNOSIS

Delay between the first visit to the doctor and definitive diagnosis averages about a month which is very much shorter than it was 20 years ago Many instances of rectal carcinoma are discovered during the first visit to the doctor and a biopsy if taken at the time permits immediate therapeutic planning It remains an unfortunate fact that if hemorrhoids are present the diagnosis is likely to be delayed several months especially if the patient s complaint has been hematochezia Many a patient gives a history of recent hemorrhoidectomy at a time when the cancer must have been detectable but was not sought A second common cause for delay in carrying out the applicable diagnostic procedures is failure to appreciate the significance of large bowel cancer as an explanation for anemia

Diagnosis depends on sigmoidoscopic and roentgenologic examination Neither is sufficient unto itself if only because of the constant threat that more than one primary cancer may be present Trans-sigmoidoscopic biopsy is the specific diagnostic procedure but is mechanically limited in its range to within about 25 cm of the anus Roentgenologic technics have a high degree of accuracy when the tumor lies above the rectosigmoid junction although they are not infallible Exfoliative cytologic methods have not yet proved to be of practical usefulness for diagnosing cancer in this location

Diagnosis of outspoken cancer which can be reached with the sigmoidoscope is ordinarily very easy because of the lesion s obvious malignant nature The best diagnosis is the early one however so that there must be special interest in the cancer which is not outspoken Appearances in the case of the adenomas have already been described Malignant degeneration occurs before gross appearances are altered. Seldom can one feel justified in assuming benignancy in a polyp which is more than a few millimeters in diameter from mere inspection Later in the course the cancer may appear to the sigmoidoscopist either as a soft fungating mass or as a hard contracting ulcer Detection of bloody pus in liquid feces is always an important sigmoidoscopic sign and when no lesion can be found and the general health of the mucosa seems normal discovery of such material within the lumen suggests that a cancer may be present beyond the reach of the instrument

Tissue removed in well-established cases by properly directed forceps almost always contains cancer because tumor is at the surface and it rarely pushes normal mucosa ahead of it In some instances of colloid carcinoma surface infection destroys the cancer cells The same is true in occasional instances of simple adenocarcinoma so that it is important to feel for firm tissue with the forceps and to take specimens from a few or several portions of suspected lesions

Roentgenologic diagnosis depends on configurational deviations the two common ones

and belching Weight loss may not be noticed for a few months and the patient then commonly ascribes it to his anorexia Weakness appears after a few or several months and only then perhaps does anemia become apparent

The second common way for cancer of the right side of the colon to manifest itself is merely through its mass The patient notices the lump but feels well He may fear it but by ignoring it hope that it will go away or he may fail to recognize its significance

The third and most characteristic syndrome is that of unexplained anemia Gross bleeding is not as common from carcinoma of the ascending colon as it is from carcinoma of the descending colon or rectum but important anemia is much more frequent The anemia is always of the iron deficiency type It is present in about two thirds of the patients at the time of diagnosis The bleeding however usually escapes the patient s notice *Often there is not a symptom suggesting* colon trouble and the patient feels only the weakness and fatigue of his anemia plus perhaps *minor weight* loss *Because the clinical* problem seems to be entirely that of anemia the clinician whose practice is limited to gastroenterology may not have the opportunity to examine the patient early in the course

Cancer of the transverse colon is notorious for its occultness Among gastrointestinal cancers this is the one which is most likely to remain undetected until the time of autopsy It usually manifests itself only through its metastases especially to liver and lungs Bowel function is not disturbed Although periodic melena is commonly demonstrable by chemical test there is something about cancers of the transverse colon which makes them difficult to detect roentgenologically *For one thing they often kill through* metastasis while they are still small For another they tend to remain rather flat and there *is no great* tendency to encircle the bowel

Cancer of the descending colon sigmoid and rectum is in anatomic position to interfere with the physiology of defecation and change in bowel rhythm or nature of the stools is the most common subjective manifestation Much is written about this and alteration of bowel habits is often pointed to as the cardinal warning of the presence of colon cancer The trouble is that most normal people have periodic changes in bowel habits —it can be considered physiologic The gastroenterologist who hears so much about bowel alterations finds himself continuously hard put to know how often he should restudy a familiar patient who periodically tells of some new change in his bowels Fortunately a few minutes with the sigmoidoscope answers many of his questions

Early changes in the defecatory pattern appear to be due to local irritation triggered by the lesion and diarrhea is commonly the result Often there are associated cramps and other forms of discomfort It must be emphasized that change in the caliber of the *stool*—pencil stools and so forth—is not a sign of cancer of the colon but of spasm or narrowing *of the anal canal or the most distal por*tion of the rectum Later obstruction becomes the important problem Obstruction *occurs about six times as commonly* in cancer of the descending colon and rectum as it does in cancer of the ascending colon There are two principal reasons the feces are in a more dehydrated state and the cancer is more likely to encircle and constrict the bowel The relative diameters of the two sides of the colon cannot be cited as important in this connection It is not unusual for obstruction to develop abruptly but more characteristically there is irregularity of bowel action first then constipation a period of diarrhea and finally obstipation The appearance *of diarrhea following severe constipa*tion is often a sign of incomplete obstruction and its significance must not be overlooked Colic distention and borborygmus are common results of exaggerated peristalsis When the tumor lies low in the rectum the local irritation and tenesmus often produce more annoyance for the patient than his other troubles

Gross bleeding sometimes with passage of bloody pus apart *from the stools is re*

for extensive resection with primary ileo-transverse-colostomy or ileosigmoidostomy Although a margin of normal bowel 6 cm wide on either side of the gross limits of the tumor is more than sufficient for complete local removal considerations of arterial supply and of satellite adenomas or a second cancer usually necessitate sacrifice of a much greater length of bowel In about 10 per cent of all cases obstruction necessitates decompressive surgery prior to definitive resection Decompression by transnasal tube is sufficient in some Preoperative preparation of the bowel by a few days of mild purgation and the vigorous use of bacteriostatic or bactericidal drugs is one of the most important measures for reducing postoperative morbidity

Postoperative complications include familiar problems of cardiovascular and cerebral origin wound infection dehiscence urinary retention etc Mechanical obstruction of the small bowel is a fairly common complication Local recurrence of carcinoma at the anastomosis is a more important problem in treatment of large bowel tumors than *it is elsewhere in the gastrointestinal tract* The recurrence rate for tumors which lie caudad to the pelvic peritoneal reflection is specially high and this is the factor that compels a radical approach to rectal cancer There seem to be three main mechanisms responsible for local recurrence implantation of cancer cells during the process of suturing loosening of cells into the local veins during manipulation and shaking of cells from the serosal surface In order to reduce the danger the surgeon ordinarily ligates the bowel with tape on either side of the tumor and ties off the accessible veins from the area before mobilizing the mass

OTHER TUMORS

ARGENTAFFINOMA

Argentaffinomas of the colon are rare tumors and cause nowhere near the same problems that they do in the small bowel and appendix The rectum on the other hand is not an uncommon site for argentaffinomas *Here they are usually discovered unexpectedly* during routine rectal examination and most at the time of discovery are less than a centimeter in diameter They are rarely multiple

The behavior of argentaffinomas of the large bowel depends to a great extent on their site of growth Almost all which originate in the cecum act as malignant lesions, metastasizing by way of the blood and lymphatic channels Only about 10 per cent of those arising in the rectum or sigmoid have the capacity to metastasize Whatever the location they may lead to mechanical problems, particularly intussusception Because most remain small and in the submucosal position bleeding does not ordinarily occur

ENDOMETRIOSIS

Endometriosis of the intestinal tract is almost always confined to the sigmoid and rectum Various observers have encountered it here in from 5 to 40 per cent of women who required surgical treatment of endometriosis The surgical incidence for the cecum is about 2 per cent Rarely the appendix is involved Some of the implants are of course very small and there must always be reasonable doubt at operation about freedom of various structures from endometrial contamination

The clinical manifestations are variable They are best understood from examining the pathologic aspects The lesions usually develop as patchy or diffuse implants representing perhaps the only situation in the body where one normal tissue invades another normal collegual tissue Acting in its role as endometrial tissue it secretes but there is no provision for drainage The products of secretion must dissect into the host tissues This is a periodic process of course synchronous with menstruation and according to the classic concept the bowel symptoms should flare up at monthly intervals Actually this happens in only about half the cases Although the mucosa rarely becomes invaded vicarious menstruation in the form of periodic

being annular constriction and infringement on the lumen In addition to diagnosis of the cancer the radiologist has the responsibility of detecting any associated adenomas or second cancer which may be present Air contrast study is necessary for this and the primary danger is too close a focus on the main or obvious lesion When obstruction has occurred barium enema fluoroscopy can give precise information regarding the location but not often the extent of the lesion Very rarely heterotopic calcification or even ossification occurs within the substance of an adenocarcinoma thus rendering part of it radiopaque The most common problem in differential roentgenologic diagnosis is that which is presented by diverticulitis particularly along the sigmoid segment This may be insoluble short of operative exploration and it should be noted it is not excessively rare to find that carcinoma exists in addition to diverticulitis

TREATMENT

Cancer of the large bowel is the most generally favorable among gastrointestinal malignancies for surgical treatment At that probably not more than 25 per cent of all patients are potentially curable by any combination of technics at the time of the first visit to the doctor On the other hand unlike the situation presented by carcinoma of the stomach palliative operation frequently alters longevity to a significant degree rather easily precludes the potential complications of the growth and most important entails a reasonably small mortality risk and only a minor postoperative morbidity problem Local removal of the tumor ordinarily makes the patient feel better rather than worse If there are no gross pulmonary or peritoneal metastases simple resection adds perhaps 10 months to the expected survival Operation carried out for cure is quite a different matter and usually only substitutes a bad problem for a worse one Cancer of the colon offers a unique opportunity for prophylaxis as has been discussed above

The resectability rate in cancer of the colon is very high for those patients who are surgically explored being in the neighborhood of 90 per cent at the moment The situation is a little less favorable in the case of the rectum It is the practice of almost all surgeon authors in all lands to carry out an operation intended for cure whenever gross metastases are not evident even though their medical colleagues may urge otherwise in some cases When extirpation is decided upon it is found that an operation which is intended for cure is possible in approximately 70 per cent of cases This is so even in very elderly people and patients more than 80 years old often withstand abdominoperineal resection as well as do relative youngsters The immediate surgical mortality rate for all cases operated upon by some type of resection is about 5 per cent and the hospital mortality rate about 10 per cent The over all five year survival rate is probably about 15 per cent Approximately one quarter of those cases which permit an operation which is intended to cure survive five years Even though many patients who survive five years die many years thereafter of recurrence most who do not live for five years die of recurrence during the first 18 postoperative months

The Miles procedure of combined abdominoperineal resection or some variation thereof is ordinarily used for definitive treatment when the carcinoma lies in the sigmoid or rectum Preservation of the anal sphincter decreases the period of survival to a significant degree and most surgeons believe that retention of the anus must be a secondary consideration when the purpose is to attempt cure Proper management of the patient with in adenoma which is found upon sigmoidoscopic extirpation to have undergone carcinomatous change without invasion of the muscularis propria poses a difficult problem There is no good answer to the question of whether simple segmental resection is then safe enough or whether radical steps must be taken Both approaches have been used for a long time but figures expressing the results are notably contradictory Carcinoma of the ascending and transverse colon often calls

gross forms may be assumed although most seem to be variations on the sphere Perforation of the bowel has been reported a few times Histopathologic differentiation between leiomyosarcoma and leiomyoma may be very difficult Most leiomyosarcomas have been discovered in women

Except when metastatic tissue becomes available for histopathologic study or when the sarcoma is obviously a multicentric disease diagnosis can ordinarily be made only after the colon tumor has been resected It will necessarily have been managed as a carcinoma Upon learning the histologic report the clinician must proceed with treatment as dictated by the findings elsewhere in the body In the usual case that of lymphosarcoma this will usually mean nitrogen mustard therapy

Hemangiomas require special comment because in the colon as elsewhere in the gastrointestinal tract there is often discrepancy between histopathologic interpretation of benignancy and clinical behavior In this location most seem to metastasize very late if at all They develop in the submucosal position enlarge into the lumen and may become pedunculated Hemorrhage is the main clinical problem but obturation and intussusception occur The diagnosis may be suggested by the radiologist when phleboliths are identified

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hematochezia is encountered on rare occasions

Less commonly a more discrete endometrioma forms It may grow to a large size but tends to remain restricted in its invasive activities Roentgenologically and at surgery such a lesion may appear very much like a primary carcinoma It may act mechanically like a benign intramural tumor sometimes initiating intussusception There are other means by which endometriosis can cause obstruction simple impingement on the bowel production of kinking and encirclement of the submucosa with the formation of a sclerosing annular constricting lesion More common than obstruction and bleeding are hypogastric pain and diarrhea sometimes with menstrual regularity sometimes without

BENIGN CONNECTIVE TISSUE TUMORS AND CYSTS

Lipoma is the most common benign neoplasm of the large bowel apart from the adenomas The tumor is usually discovered when the patient is between 40 and 50 years old but often there is a history of intermittent symptoms for several or many years previously Almost all lipomas originate in the submucosal layer and enlarge slowly into the colon lumen They are often palpable by the time symptoms appear As outlined by barium enema their configuration is basically spherical but often there are superficial lobulations and sometimes rather angular portions Ulceration is common but is not ordinarily deep Bleeding occurs in about 40 per cent of the cases but is usually of small amount The common clinical problem is intermittent mechanical bowel obstruction In half the patients intussusception is the first sign of trouble Although it may be self reducing there is a tendency towards intermittent recurrence Volvulus is a less common complication

Leiomyomas are considerably less common than lipomas They originate from the muscularis propria of any segment of the large bowel and usually their expansion carries them into the lumen Extracolic leiomyomas may reach a very large size—football occasionally—before they make their presence known Dumbbell tumors are rare Initiation of intussusception is a common manner of presentation Sometimes there is deep ulceration with sudden severe hemorrhage

Duplication cysts or *enterocystomas* of the colon are unusual lesions Duplication and triplication of the entire organ have been described The cyst may develop in the mesentery along the mesenteric aspect retroperitoneally or it may actually form part of the bowel wall sharing the muscularis propria It has the same blood supply as the colon There may or may not be communication with the colon proper In either case the contents of the cyst sometimes cause obstruction through extrinsic pressure

SQUAMOUS CELL CARCINOMA

Squamous cell carcinomas are occasionally encountered in the rectum usually in its lower half Their incidence is probably about 0 2 per cent of all rectal tumors The cytologic origin is not understood Clinically these unusual carcinomas behave like adenocarcinomas

MALIGNANT MELANOMA

Malignant melanomas account for about 1 5 per cent of malignant lesions of the anus and rectum Approximately 1 0 per cent of all malignant melanomas originate at these sites Ordinarily they arise just above the anus and it can usually be assumed that any such tumor encountered in the upper colon is of metastatic origin Often the mass shows no gross pigmentation as it is inspected through the sigmoidoscope although its metastases are ordinarily dark

SARCOMAS

Sarcomas of the large bowel are very rare At least 95 per cent are lymphosarcomas Other types have been reported such as leiomyosarcoma and angiosarcoma Any part of the colon may be affected Lymphosarcoma may be unicentric in the colon or part of the more usual multicentric disease Many

one of the more common congenital anomalies which untreated are incompatible with life The incidence is approximately 1 per 5000 live births

Normal embryology calls for division of the cloaca into its urogenital and intestinal portions by growth of the urorectal membrane during the seventh week This has nothing creating obstruction above the normal anal canal

Obstructive anomalies therefore vary according to the position and extent of closure Imperforate anus due to a membranous septum is the simplest form The lumen may not be completely blocked and there may be in addition stenosis at or just above the

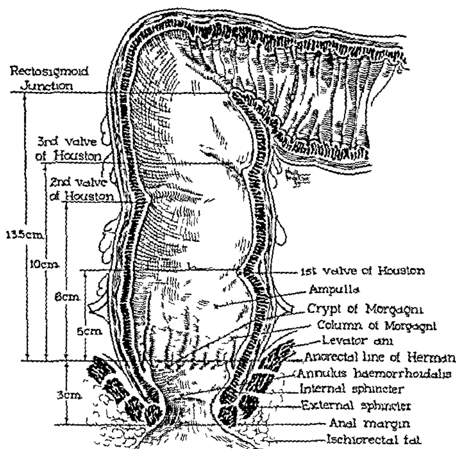


FIG 163 Anatomy of anorectal region with some anatomic measurements as they are encountered at sigmoidoscopy

to do with the anal sphincter mechanism which develops quite separately The proctodeal segment is of ectodermal origin Its anal membrane which is a normal structure ordinarily dissolves spontaneously during the eighth week As the rectal tube continues to grow it develops two areas of relative dilatation The narrow portion between the two may apparently continue to close down during the third fetal month even to obliteration thus anus The most common variety combines an imperforate anal dimple with a blind rectal pouch which ends some distance above the anal level Less frequently there is a normal anus and anal pouch but no communication with the rectal pouch which ends at the midsacral level A fistulous communication between the rectum and the genitourinary organs or the perineum is present in approximately half the cases In the female infant

CHAPTER 13

ANORECTAL AREA

Because of their accessibility diseases of the anorectal area are very easy to diagnose and easy to approach for manipulative therapy compared with those of other parts of the gastrointestinal system As favorable as this seems there are few areas of the body where a tiny lesion or an apparently insignificant disease process can cause a person so much misery or demand such precisely correct management The growth of the surgical subspecialty of proctology attests not only to the importance and frequency of disease in this area but also to the highly specialized surgical technics which are required for management of most Because this chapter deals with some matters which have been dismembered from the gastroenterologic empire some of the discussions are brief The gastroenterologist must nevertheless continue to take active interest in the area and responsibility for its diseases if only as a passive consultant for many of them The dividing line between large bowel disease and anorectal disease is an arbitrary one and the examination technics and many of the disease processes which are met in the rectal area have already been discussed in the preceding chapter

CONGENITAL ANOMALIES

Congenital malformation of the anorectal area usually takes the form of some variation of anal or rectal atresia Persistent cloaca is a much less common anomaly In the majority of cases—about 75 per cent—there are important anomalies elsewhere in the infant and the high mortality rate which is encountered in babies with imperforate anus is largely ascribable to these Particularly common are anomalies of the genitourinary tract There is a minor preponderance of males among affected infants Imperforate anus or rectum without associated fistula is

the patient has been constipated which is often the case because then it is found that control of the constipation is often sufficient to control the intussusception In any case straining at defecation is to be avoided and detailed instruction of the patient in the mechanism of his defect should help him understand why If his stools are kept soft he may be able to comply

RECTAL PROLAPSE

By general usage prolapse when applied to rectal disease includes both simple sliding of the mucosa and procidentia of all layers of the organ through the anus The latter is by far the more common problem The weakness which permits inversion and transanal migration of the rectum may be either congenital or it may be acquired and therefore prolapse is encountered mainly among infants and small children and among elderly people About 10 per cent of instances which are encountered in adults had their beginnings during childhood Males seem a little more susceptible than females

Prolapse may take several anatomic forms but these are really no more than progressive stages in one process The most common variation is merely protrusion of redundant rectal mucosa through the anus The protrusion is usually of small amount (Fig 164) but rarely may extend as much as 6 cm beyond the anus nevertheless it is only mucosa which has become displaced The second major type is from the start an intussusception of all rectal layers beginning just above the anal canal The peritoneum does not participate in the prolapse even though the protrusion may become sizable In the third general type the pelvic peritoneum joins the herniation as the rectal wall invaginates through the anus being drawn down through the weak area which has developed through the transversalis fascia and the pelvic diaphragm The protruding mass may expand to a length of about 15 cm It assumes the shape of an inverted cone As it enlarges the anterior aspect of the rectal wall descends faster and farther than the posterior so that the external opening of its lumen comes to lie posteriorly rather than at the tip of the mass Into the peritoneal sac which its base contains loops of small bowel may herniate

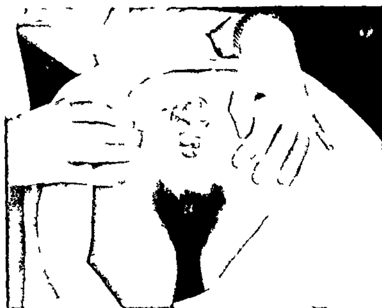


FIG 164 Prolapse of the rectum

The causes of rectal prolapse have to do mainly with poor support from below Although it is possible for the rectum and it

the fistula commonly empties into the vagina and in the male the distal urinary tract is usually involved

Diagnosis is usually made or suspected at the time of birth during the routine natal physical examination If an anal pouch is present the deformity may escape notice for the moment The infant passes no meconium or meconium emerges at an unusual site If there is only a thin membranous obstruction at the anus the meconium can sometimes be seen shining through

Precise anatomic diagnosis requires careful roentgenologic examination Normally swallowed air reaches the descending colon about six hours after birth If a radiopaque marker is placed at the anal dimple and films are taken with the infant held upside down an air shadow will mark the terminus of the rectal pouch and its location and distance from the anal area can be determined This is a good technic but interpretation may be very difficult In some infants an interval of 48 hours or more is required before the distal colon opens up to admit gas Several films in different projections should be taken and a rounded ballooned out segment should be identified with assurance before one assumes that the gas has reached the atretic segment If the end of a fistula can be found and is accessible injection of radiopaque dye may permit examination of its full extent

Treatment is a surgical matter and should be carried out without delay upon recognition of the obstructing anomaly The approach depends on the distance from patent bowel to anal dimple Thin membranes may be simply ruptured Ordinarily a one stage operation for anastomosis is done usually via the perineum Temporary colostomy is not necessary unless the condition has been neglected for several days

MECHANICAL DISEASES

SIGMOIDORECTAL INTUSSUSCEPTION

This interesting entity is probably not rare although it has not been studied sufficiently to permit judgment of incidence Invagination of the sigmoid into the rectum is a simple intermittent process initiated usually during defecation and reducing itself spontaneously within a short interval thereafter Both obstruction and strangulation are rare Its clinical manifestations are not necessarily suggestive of the diagnosis and it is easily overlooked during rectal examination Pathologic material hardly ever becomes available and because introduction of barium suspension into the rectum causes reduction of the intussusception it is rarely possible to obtain a roentgenologic record of the defect even when its presence is known

This is nevertheless a positive entity as sigmoidoscopy can prove The patient is likely to be middle aged of either sex His main complaint is tenesmus and this is described as an urge to strain excessively immediately after defecation There may be at other times a periodic sensation of pelvic pressure or fullness which often is relieved upon lying down Excess mucus and occasionally blood may be noted on the stool Some patients have periodic attacks of proctalgia fugax

If the intussusception is to be detected the patient must be examined in the squatting or less favorably the Sims position If the examination begins with the patient in the knee chest position the intussusception will reduce itself automatically Digital palpation reveals in the rectal ampulla a firm rubbery mass Once this has been found its nature can be recognized by sigmoidoscopy in the Sims position The intussusceptum can be reduced easily with a little pressure through the sigmoidoscope Then appearances become normal in both the rectum and sigmoid except perhaps for some surface erosion When the instrument is withdrawn from the sigmoid it may induce invagination once again

Treatment is not likely to be *especially* successful Segmental resection of the redundant sigmoid has been done in a few cases apparently with gratifying results Unless however there should be incarceration with obstruction or strangulation which is very rare surgical management seems too radical an approach in most cases It is fortunate if

usually about 10 minutes Pain builds up to a climax in about half a minute and then be comes agonizing It is felt in a small area which seems to be about an inch or two above the anus There is no radiation The sensation may be described as a cramp or a bursting stretch It is not sharp or burning On one point all patients agree it is excruciating pain the worst kind that the patient has to put up with in his ordinary living Usually he jumps quickly from bed and walks the floor Even though his previous experience has taught him that it will be of no avail he often goes to the bathroom and attempts to move his bowels Sometimes the straining seems to help a little but the Valsalva maneuver involved plus apparently the pain sometimes causes fainting at this point The patient finds himself contracting and relax ing the perineal muscles in an effort to dis lodge something The sensation of a huge rectal mass may be so real to the patient that he may take a hurried enema with dis appointing results After about 10 minutes have passed the pain lessens and then dis appears over a period of about a minute The sense of relief is exhilarating The patient is seldom convinced that any of his manipu lations have helped but nevertheless has the urge to carry them out each time

The mechanism of proctalgia fugax is ob scure Sensation from the rectum passes into the sacral portion of the spinal cord over the pelvic nerves through the middle hemor rhoidal pelxus It is certain that the pain is due to muscle spasm but the individual muscles involved have not been identified The origin may well be extracolic Rarely is the clinician able to examine the patient dur ing an attack If he should be fortunate enough to have the opportunity he finds that the anus is not elevated and that therefore the levator ani muscles are not in spasm The anal sphincter is rather tight and sore but not spastic The rectum is empty or may con tain a small amount of feces Palpation about the rectal wall may be a little painful No area of spasm can be felt although segments judged to be at the levels of Nelaton s and Hyrtl s valves (Fig 133) may be felt to close down around the finger from time to time Although information about sigmoid oscopic appearances during paroxysms is very scanty it has been found in a few pa tients that the rectosigmoid sphincter is in spasm during the painful interval

There is no way known to stop an attack or to prevent recurrence There is no time for analgesia Fortunately the pain is self limited Amyl nitrite inhalation seems to abort attacks in a small proportion of patients Stimulation of the gastrocolic reflex through quick drinking of a couple of glasses of water has been suggested but it is not very effective

OTHER FORMS OF PAROXYSMAL RECTAL PAIN

Of the great many types of pain that are felt in and around the rectum and perineum a few other than proctalgia fugax may be paroxysmal and some may be paroxysmal during certain periods *Tenesmus* is the most common of these It is not an excessively painful sensation but its discomfort is mad dening and its main characteristic is frustra tion of the sensibilities The patient feels that if he could only defecate a little more he could be comfortable but he cannot The sensation is attributed to spasm of the rectal ampulla Inflammatory disease of the rectal mucosa is the usual cause although rectal tumors and foreign bodies are sometimes responsible

Tabetic rectal crises are now very rare The pain is characteristically sharp and it may last for a few hours at a time

Rectal neuralgia a term which is not en tirely satisfactory is used to describe the main paresthesia of the rectum The altered sensation is always that of burning felt either high above the anus deep under the pubis or through the sacral region Radiation to the upper thighs and to the perineum is common The burning may last for hours or days at a time No organic explanation can ever be found

Disease of near by organs may cause peri odic painful spasm of the rectum or tenesmus in an occasional patient Cystitis and prosta

mucosa to be unusually mobile from the start mere mobility by itself does not permit prolapse Poor muscular and fascial support may be the fault of development or it may be acquired gradually through periodic parturition or straining during defecation Probably loss of perirectal fat during the aging process decreases support It is difficult to know whether weakness of the anal sphincter is part of cause or wholly effect By the time the patient is first studied the sphincter may already be greatly stretched and weakened and eventually there may be complete paralysis Secondary results of chronic recurrent prolapse include marked rectal mobility and redundancy of the pelvic colon

Clinically the main problem for the patient is simply the protrusion itself Prolapse follows defecation At first the mass recedes spontaneously but as time goes on it must be replaced manually This must always be done for a child of course and at times the adult patient finds himself unable to reduce his prolapse by himself With sphincter relaxation incontinence may become a problem and eventually the prolapse may tend to drop down whenever the patient is on his feet The mucosa is subjected to considerable irritation leading to bleeding from time to time Some patients with rectal prolapse have chronic constipation some have mild diarrhea but most have no problems with bowel function per se

Upon clinical examination often no abnormality can be found externally or within the rectum if the organ is in its normal position In order to produce the phenomenon the patient must often squat and strain and if any patient gives a history of a protruding mass at the anus he should be directed to go through this maneuver at the time of examination Often prolapse can be demonstrated in no other way Examination of the mass does not usually permit one to judge whether or not it includes a peritoneal pouch a vital point in approaching therapy It might be thought that auscultation and percussion of the protruding segment would show whether it contained loops of small intestine but interpretation of the findings is too difficult to be reliable

Prolapse is a simple mechanical disease but it is very difficult to correct satisfactorily Treatment must be surgical A great many procedures have been advocated but although immediate results of most are good the recurrence rate for all eventually becomes high Simple mucosal prolapse may be managed safely by sleeve resection of the redundant mucosa Later however more mucosa may become mobile and then a prolapsing segment reforms Unless one finds that he can exclude with confidence the presence of a peritoneal pouch in the prolapsing segment the tissues must be replaced rather than resected blindly Some surgeons prefer a perineal approach but most believe that it is important to repair the floor of the pelvis and this must be done from within Simple suspension fixation operations do not work out well unless provision is made for adequate support from below Whatever technic is chosen it is important that the stools be kept soft postoperatively and until thorough healing is assured About four months should be allowed for this It is suspected that many surgical failures can be blamed on inadequate postoperative conservatism

PAROXYSMAL RECTAL PAIN

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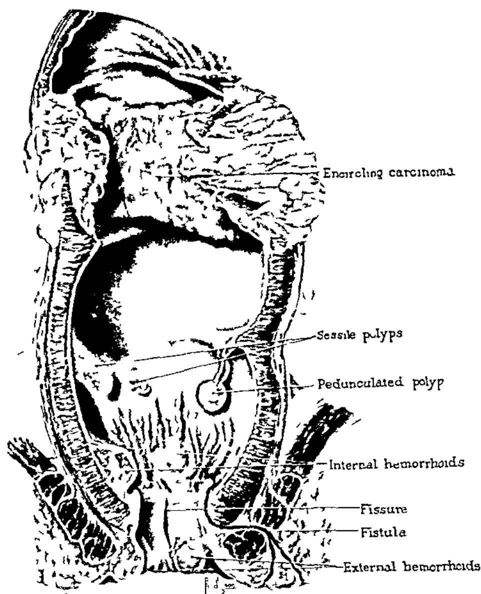


FIG 165 The common discrete lesions of the anorectal region

chronic aggravation of local medicinal applications etc

The itching is concentrated in the immediate perianal region but it may extend to the genitalia inner thighs and buttocks It is constantly or almost constantly present worse during hot weather and symptomatically most important at night It is maddening The patient becomes frantic at intervals and in his frenzy may tear at and superficially mutilate himself He cannot carry out his normal functions and duties effectively Sleep may be impossible for days at a time There are periods of wild search for relief from any source Several doctors may be visited within a few hours All sorts of local measures may be tried by the patient, including application of corrosive agents and scalding water Suicide is not rare

When the anal area is examined after the pruritus have been active for some time it is found that the perianal skin is either dry

titis are common causes The rectal pain of *spinal cord tumors* is usually persistent but may have paroxysmal exacerbations

The pain of *coccygodynia* is often referred to the rectum It tends to radiate to the thighs the sacral area and the suprागluteal region It may last for hours or even days depending to some extent on passive movements of the coccyx Common causes are trauma arthritis and neuralgia Pain is brought out during examination by manipulating the coccygeal area and then it is found that the levator ani pyriform and coccygeus muscles are thrown into spasm

PRURITUS ANI

Pruritus ani is one of the more difficult gastroenterologic symptoms to treat It may be a manifestation of a great variety of diseases gastroenterologic and other and part of the problem of therapy lies in its nonspecificity as a symptom The doctor is relieved if a local anatomic explanation can be found but the patient may not be Because etiology is difficult to delineate from incidental defect and because some little abnormality can so often be found about the anorectal area whether the patient has pruritis or not there is danger of ascribing the symptom to the wrong cause If the suspected local disease is only an incidental abnormality its treatment usually results in aggravation of the main problem the pruritus For this reason critical evaluation of the symptom as a symptom is likely to prove more valuable than the careful examination which is sometimes urged as the first point of business Both of course are important

CHRONIC PSYCHOGENIC PRURITUS ANI

Two decidedly different types of pruritus ani are easily recognized and it is important that the clinician be impressed by this difference Although of course pruritus like any other symptom occurs with all degrees of severity the subjective manifestations of the chronic psychogenic type are different and far more intense than those due to primary organic disease The psychogenic type is also by far the more common To the patient the pruritus is the whole disease and there is no complaint other than it and the trouble it causes About three quarters of the patients are men and most are between 30 and 50 years of age at the time they seek help

Although this form of pruritus ani is usually labeled cryptogenic " it is time that the often expressed opinions of those who have had most experience with it be respected and that its psychogenic basis be freely recognized It is difficult for those who have not had a primary interest in psychiatry to understand the psychodynamic factors which have been proposed These factors although of great interest in theoretical psychiatry are not very useful in dealing with practical clinical management It is always clear enough that the patients have emotional problems They are overtly nervous although it is usually not possible to be sure that this is not merely the effect of the pruritis There are often sexual problems premature ejaculation being common in men and frigidity in women It is usually postulated in psychodynamic circles that the patient recognizing his sexual inadequacy falls back on the normal infantile pattern of anal eroticism a state in which he can feel some security Apparently both masturbatory and masochistic factors are at work in the patient s dealings with the emotional problems he meets here Of all the parts of the body the anal area and the external auditory canals show the greatest readiness to itch For the former the sensory nerves which participate are the inferior hemorrhoidals perineals posterior femoral cutaneous and anococcygeals The trouble begins with rubbing and rubbing seems to be the most potent irritant for initiating itching about the anus From here on the perpetuating cycle is well known—substitution of the more tolerable pain of scratching for the intolerable itching increased stimulus for itching chronic skin injury and repair with all that that implies for perpetuating pruritus

likely to be intermittent becoming extremely bothersome at some times but clearing spontaneously for variable intervals Hot weather and night time are usually the most aggravating periods As a rule the pruritus is only one of the patient s problems

Among the causes probably chronic local soiling is most common This may result simply from poor habit relative anal incontinence or discharging regional lesions The irritation of foreign material is sufficient to initiate the pruritus cycle particularly if it is moist or if hot weather or obesity add intertrigo to the process There has been some question whether the feces may at times contain specific injurious substances representing end products of protein digestion but there is no reason to assume that some special agent is necessary to explain local irritation True perianal allergy does however exist although it is probably rare and is always difficult to evaluate Drug dermatitis particularly that due to suppositories and oral antimicrobial agents may produce an extremely difficult form of pruritus Discharges from proctitis fistulas sinuses fissures and cryptitis are common causes of pruritus and they may encourage secondary mycotic infection Primary fungus infection of the perianal area by itself must be considered a very rare cause Pinworm infection is a frequent explanation for pruritus in children but discovery of the worm in the adult who has pruritus must usually be viewed as coincidence Primary regional skin diseases including simple intertrigo and scabies are not nearly as common as secondary skin changes Generalized pruritus is often part of the clinical picture of diabetes and the menopausal syndrome but local perianal pruritus is not Formerly anogenital pruritus was common in uncontrolled female diabetics

Treatment may take many forms depending on the nature of the basic disease The important matter is delineation of this secondary form from the psychogenic form so that local surgical manipulations can be avoided in the latter This is ordinarily not a difficult matter In addition to elimination of the primary local disease or condition the general principles of anal hygiene as mentioned above should be observed

PROCTITIS

The rectum participates in most of the inflammatory processes which affect the colon such as ulcerative colitis amebic colitis and the drug reactions but in addition there are inflammatory diseases which are limited largely to the lower segment

ACUTE NONSPECIFIC PROCTITIS

There are an acute and a chronic form of ulcerative proctitis which are limited to the rectum and have no association with the more familiar processes which affect the colon These are poorly publicized diseases yet they are not uncommon and they are far from unimportant

Acute nonspecific proctitis is characterized clinically by rectal bleeding mild diarrhea and tenesmus Onset is usually sudden without any circumstance which might suggest etiology organic or emotional Even though the patient has no systemic manifestations such as fever the bowel manifestations may be moderately severe Blood loss is not severe There is no leukocytosis Microscopic examination of the stools shows blood and pus cells but no protozoa Stool cultures fail to reveal bacteria known or suspected to be pathogenic After two to four weeks the process may clear spontaneously only to recur after an interval of a few or several months In the interims the patient feels entirely well Exacerbations are never frequent and do not follow each other closely

Sigmoidoscopic examination shows a picture similar to that of early active ulcerative colitis but the process stops abruptly at the first or second Houston valve or less frequently at the rectosigmoid junction There is diffuse edema and intense hyperemia with many tiny erosions There is slow bleeding and large amounts of purulent exudate are regularly found Mucosal biopsy specimens show active acute inflammation along the bases of the rectal glands with focal abscesses and small erosions When the

shiny firm and red or it is weeping gray very thick and fissured The degree of lichenification may be very severe In either case the perianal hair has disappeared and there may be pigmentation in the area Any degree of factitious excoriation may be found around and in the anus Secondary infection is usually mild Biopsy specimens from the area show acanthosis hyperkeratosis and parakeratosis The rete cells are often coalescent The papillary portions show edema and fibrosis and round-cell inflammatory infiltration may be everywhere

Effective treatment makes a demand for expert psychiatric management This is the primary responsibility to the patient and it is urgent Most gastroenterologists will feel impotent in dealing with the major psychiatric problems which are met in these patients

For the gastroenterologist s part there are a few secondary local matters which must receive attention coincident with active psychotherapy There is no question but that poor local hygiene is the main encouragement for perpetuation of the secondary organic changes Unfortunately it is often not possible to keep the patient from scratching even though this be recognized by all concerned as the most important offender Local applications which are strong enough temporarily to obtund the itch are strong enough to aggravate the over all problem Local anesthetic agents are in general more harmful than helpful The problem of infection is usually a minor one and therefore antimicrobial agents have no place A good proportion of patients obtain tremendous help from local applications of 1 per cent hydrocortisone ointment although a few exhibit no response at all While the psychiatrist is doing his work this is probably the best preparation for routine local use In the majority of cases good relief is felt within two days and it may be complete in a week Recurrence is to be expected if the preparation is discontinued prior to accomplishment of a degree of psychiatric progress Regulation of the bowels seems to be important Local cleanliness is a necessity not only because fecal soiling is a source of irritation but also because the normal secretion of the perianal apocrine glands constitutes a good culture medium through its near neutrality and its carbohydrate and protein content The irritation of rubbing with toilet paper must be avoided and rubbing with cotton is no less irritating The important stimulus comes from the rubbing not the material used Local rinsing with water and pat-drying are practicable Coincidental anal disease such as hemorrhoids must not be treated surgically if any other temporizing measure can furnish even a poor degree of help

The several technics for making a more definitive therapeutic attack on the pruritic area circumvent the patient s main problem and are to some extent at cross-purposes with psychotherapy One would be unrealistic however, to say that radical treatment of the symptomatic area has no place in this disease It has and this is just another way of saying that psychotherapy of pruritus ani is difficult The various radical local procedures do not guarantee good or even fair relief from symptoms it is to be noted soberly that the patient may continue to complain of pruritus following total surgical denervation of the itching area Small doses of x irradiation often depress pruritic hyperexcitability of the region This approach helps a portion of the patients unpredictably Tattooing with mercuric sulfide for certain patients whose perianal skin is moist and lichenified continues to be used with fair enthusiasm in some quarters Local subcutaneous injections are gradually being discarded as unsatisfactory Undercutting operations have a few advocates It is sometimes found that presacral neurectomy following favorable repsonse to a test of presacral nerve block provides a good solution for the local problem in some cases but as with the other radical procedures the results are discouragingly unpredictable

PRURITUS ANI OF ORGANIC ORIGIN

This type of pruritus is not as severe as the preceding and the perianal skin changes do not become as severe The symptoms are

if it should develop must be tended Local instillations must not be used There is no acute fulminating phase to the disease and therefore steroid hormone therapy has no place Dextrose agar or dextrose psyllium gives some degree of symptomatic help There is nothing to be gained by advising bed rest or other invaliding regimen although the patient often finds it advantageous to make an invalid of himself



FIG 166 Biopsy specimen of rectal mucosa in case of chronic nonspecific proctitis

LYMPHOGRANULOMA VENEREUM

Lymphogranuloma venereum (lymphopathia venereum lymphogranuloma inguinale Frei s disease) is a common venereal disease of virus etiology but during the past few years the newer antimicrobial drugs have had a great effect on the effectiveness of early treatment and the prevention of rectal and other complications Lymphogranuloma venereum of the rectum is rapidly becoming a rare entity in the gastroenterology clinic

Rectal involvement is confined largely to women. This seems to be because of sex differences in lymphatic drainage into the rectal wall In men drainage from a penile lesion characteristically is caught by the inguinal nodes with production of buboes a month or month and a half after infection but there is no spread in the direction of the rectum In women whose primary lesion is likely to develop high in the vagina or on the cervix drainage is directly toward the rectum

There are two fairly distinct stages in the rectal aspects of this disease Acute proctitis develops one to two months after initial infection Clinically it is manifested by bleeding of only small amount but of notable persistence With the blood there is often a purulent rectal discharge Usually the

process clears it does so quickly The mucosa becomes grossly normal in a day or two and *after about three days nothing can be found* upon biopsy study to suggest residual damage

Diagnosis depends to some extent on observation of the course of a whole episode At the start the clinical and sigmoidoscopic impression may well necessitate the diagnosis of early ulcerative colitis and indeed many cases of ulcerative colitis begin this way Later one may wonder about abortive ulcerative colitis if there really is such a form *but the rapidity of the clearing process* and the absence of systemic repercussions mark this as a different disease

Treatment during the first recognized episode may be hindered by diagnostic uncertainty If a patient has had recurrent exacerbations and the nature of his case is already known it is found that a 10-day course of sulfathalidine will often be accompanied by remission Because of the natural spontaneity of remission it is difficult to judge the actual effectiveness of therapy Sulfa nevertheless appears to be the treatment of choice Rest and simple supportive measures are important symptomatically *but do not seem to influence the* mucosal disease

CHRONIC NONSPECIFIC PROCTITIS

It is possible to speak with a little more certainty about this chronic counterpart of acute nonspecific proctitis One of the most indolent of rectal diseases it must be distinguished carefully from ulcerative colitis to which it bears several similarities There are three main differences Although chronic *nonspecific proctitis may remain active for* years it never extends beyond the rectum Secondly the manifestations remain local The patient feels well except for his rectal complaints Nutrition remains good *There* is no important fever, general toxicity leukocytosis or elevation of the sedimentation rate Finally no evidence can be found to suggest that coincident disease may develop in other organs or tissues such as the skin joints liver or eyes

The emotional and personality characteristics of patients with this disease do not seem similar to those of patients with ulcerative colitis They *do not fit well into any* pattern In general a certain dependency may be noted but it seems rather superficial and is not well directed Momism is not found Some patients seem to be calculators and big dealers They make active use of their chronic rectal disease to *manipulate* their environment

*The onset of rectal complaints is ordi*narily gradual with mild spells of diarrhea and hematochezia Diarrhea becomes persistent but it is never severe Usually the patient has about four semiliquid or soft stools daily Proctitis induces spasm of the anal sphincter so that the stools often have a narrow ribbon configuration They contain patches of bright blood Tenesmus is common The most characteristic feature of the clinical course is its steady persistence for many months or years Blood loss may lead to mild anemia but the patient does not otherwise suffer

Appearances upon sigmoidoscopic examination are entirely similar to those found in active ulcerative colitis The process never extends beyond the rectosigmoid junction and it may not reach the third valve Noth*ing abnormal is found in the sigmoid* Microscopic examination of the mucosal exudate shows the same elements that are found in ulcerative colitis Similarly mucosal specimens *removed by biopsy appear identical* to those obtained during the active stage of ulcerative colitis (Fig 166) The balance between destruction and repair seems remarkable Gross and *histopathologic evidence* of inflammatory activity is found month after month

There is no effective means of altering the course of the rectal disease *No good ideas* have been expressed as to etiology and various therapeutic trials have failed to give a hint for specific therapeutic thinking A normal diet is best Iron *deficiency anemia*

the colon. Strictures develop often a few centimeters above the anus but at times throughout the rectum and even up into the colon. The valves are blunted or not recognizable as such. The wall feels firm but is not hard and the designation rubbery fibrosis is apt as opposed to the woody fibrosis of ulcerative colitis. The mucosa itself is edematous ulcerated and scarred. Bleeding and exuding of large amounts of purulent mucus are characteristic. There may be pseudopolypoid hyperplasia.

Anal and perirectal complications regularly develop in the untreated chronic infection. The anus loses its sphincter to inflammation and fibrosis and late in the course a patulous anus is a common finding. The rectal wall becomes greatly thickened—up to 2 or 3 cm in some cases—and into it and through it sinuses abscesses and fistulas develop. Local destruction may be extensive and repair is accompanied by gross deformity of the pelvic structures. The process is one of blatant indolence.

Diagnostic and therapeutic considerations depend on the over all picture of illness. Reliance is placed upon the Frei test. Acute proctitis is quickly brought under control by treatment with Aureomycin or Terramycin. Both Aureomycin and Terramycin also are effective in producing resolution of the granulomatous fibrosing lesions of the chronic rectal complications. Even tight strictures may disappear under simple antimicrobial therapy. The effect on fistulas and pararectal abscesses is unpredictable however and sometimes it is necessary to carry out radical extirpation of the inflammatory pelvic mass.

GONORRHEA

Occasionally gonorrhea produces primary infection of the rectum. The sigmoidoscopic picture is that of acute nonspecific proctitis with changes whose intensity varies from mild to intense. Hyperemia edema bleeding erosions and pus are found. Both stained smears and special gonococcal cultures made from mucosal swabbings readily provide the diagnosis but these are hardly routine proctologic procedures. The history and general sizing up of the patient must provide suspicion of the etiology first and for this reason one must constantly keep such rare entities as gonorrhea proctitis in mind while practicing gastroenterology.

POSTIRRADIATION PROCTITIS

Injury to the rectum and pararectal tissues is an unfortunate sequel to pelvic x irradiation therapy and the result in some cases may be a most extreme degree of morbidity. Clinically significant postirradiation proctitis with or without sigmoiditis develops in about 5 per cent of women treated for cervical and uterine carcinoma. This group furnishes by far the largest number of patients. There is a good deal of individual variation to radiation tolerance but as a generality a maximum safe depth dose for the rectum is about 4 000 r over a 30-day period.

The first important evidence of damage as observed endoscopically usually makes its appearance about two weeks after completion of radiation therapy. Acute inflammation of the rectal mucosa is found. The surface is edematous hyperemic and spotted with erosions. These changes persist and as time goes on the chronic results of injury extend through the rectal wall. The basis seems to be primarily vascular common pathologic findings being arteritis thrombosis and focal infarction. By five months chronic injury is well developed. The mucosa is chronically inflamed with irregular bleeding ulcers and purulent exudation. The ulcers are often encompassed by venous telangiectases. Healing is very slow and is accompanied by much scarring stricturing bleeding and fistula formation. Sinuses commonly extend to the vagina and bladder. The pelvic organs become fixed. Actual rectal obstruction is unusual.

As serious as the tissue damage may be for the patient the most important manifestation of the process is rectal pain. This has characteristics similar to those of proctalgia



FIG 167 Lymphogranuloma venereum of the rectum This is a typical picture of the chronic stage

patient has no pain Sigmoidoscopic examination which is attended by danger of infection to the doctor shows a striking picture of disease The mucosa is intensely hyperemic and edematous with many bleeding erosions and scattered petechiae The process has the appearance of wild activity Although there may be nothing specific about the picture it has been reported that yellow mucosal vesicles may be present and these might be considered suggestive of lymphogranuloma

In some cases rectal involvement does not become apparent until the chronic stage is reached Stricture may be the first clinical manifestation and if a degree of obstruction develops pain may appear for the first time The result of chronic rectal lymphangitis and transmural inflammation is fibrosis The changes are well studied both endoscopically and roentgenologically The rectal and lower sigmoidal configuration becomes tubular and narrow (Fig 167) The process may extend a long way up into

but be taxed continually in their expected function of keeping themselves clear through their own secretions In addition weakly secreting anal ducts extend from the bot toms of some of the crypts in some people and course outward and downward often penetrating the internal anal sphincter to end blindly in some cases as far out as the iliac fossa The crypts and their ducts as blind tracts form the starting point for most anorectal infections including fistulas and fissures

When inflammation remains localized in the crypts of Morgagni just behind the anorectal mucocutaneous junction the entity is known as cryptitis but cryptitis is almost always present too when one of the more extensive regional infections is at work As in other diverticular areas of the gastro intestinal tract local infection of the crypts causes little trouble until obstruction de velops Feces secretions and tiny foreign bodies if trapped by edema at the crypt orifices lead to the formation of tiny ab scesses These usually rupture quickly again out through the orifices but meanwhile considerable local inflammatory reaction may develop Thus hypertrophy of the anal papillae secondary to chronic inflammation usually accompanies cryptitis It is easy to see how an abscess from a closed crypt might burrow downward perhaps with the help furnished by the path of an anal duct to form an anal fistula or to develop into a perianal abscess The behavior of infection which extends downward from a crypt de pends to a great extent on the exact point of its origin on the anal circumference

Cryptitis of some degree probably de velops in everyone from time to time but in the absence of cryptal occlusion goes no farther and clears spontaneously Cryptitis is one of the most common findings on routine anorectosigmoidal endoscopy Usu ally the patient has had no symptoms or very minor ones Sometimes there has been per sistent or recurrent sharp or burning anal pain greatly aggravated by defecation Spasm of the anal sphincter is a constant reflex Pruritus and formication following defecation are common Drainage of small amounts of material from the anus and blood streaking of the stools often occur when inflammation is active

Upon anoscopic examination it is found that the area of the crypt orifices and neigh boring surfaces are hyperemic and edematous There is purulent exudate in the area or some may be expressed by milking or ex ploration of the crypts with a crypt hook There is papillitis and in chronic cases the papillae may be very large even permitting their prolapse through the anus when the anoscope is withdrawn A crypt skin tag may present external to the anal canal in line with and containing the blind end of an infected diverticular extension A degree of anal spasm is present

Treatment of uncomplicated cryptitis often calls for opening of some of the crypts by short incisions between the columns of Morgagni The best procedure seems to be a conservative one particularly regarding the number of crypts which are opened Bowel control is important and astringent suppositories are good for the area following the local manipulations

ANAL FISSURE

An anal fissure is a longitudinal ulcer within the anal canal attended by a varying degree of underlying infection and reactive fibrosis The interesting arguments to be found in the literature of the past 70 years over proper definitions and interrelationships of anal fissure and anal ulcer have not been resolved and at the moment it seems best not to subdivide the disease Although not rare among pediatric proctologic prob lems fissures usually appear during the third through fifth decades without sex prefer ence Practically all of those which occur in men and about 90 per cent of those in women lie over the posterior anal com missure The rest are usually close to the anterior midline Only one fissure forms The disease is usually initiated by trauma to the mucosa of the anal canal causing a simple

fugax but it is continuous and continuously severe It may be confined to the rectal area or be felt most in the sacral or hypogastric area Often there is tenesmus too Naturally all tissues in the area have been subjected to the injury The relentless diarrhea often with blood seems rather inconsequential *to the patient compared with* the distress unless the injury has included destruction of the anal sphincter

In many cases all symptomatic help seems futile It is often as much as one can do to avoid narcotic addiction in his patient In other cases the damage if superficial may clear spontaneously There is no way to alter the course of the process medically and the best that one can ordinarily do is try various symptomatic regimens Neurectomy or chordotomy may eventually seem necessary Fistulous complications require surgical efforts at eradication The discouraging postoperative results in terms of poor healing *and refistulization are well known Because* of damage to the nerves of the pelvis in general radical proctectomy cannot be expected to furnish symptomatic relief It should be emphasized that postirradiation proctitis is uncommon and can often be considered justifiable

FACTITIOUS PROCTITIS AND OTHER TRAUMATIC PROCESSES

The danger of peranal trauma is that of perforation with establishment of infection within or outside of the rectal or rarely sigmoidal wall Ordinarily factitious injury is a superficial process and one must be impressed by resistance of the tissues to direct injury The compact external support of the lower rectum can be accepted as part of the explanation Spontaneous rupture of the apparently healthy upper or peritonealized portion of the rectum during defecation has been reported and of course if there be mural disease even moderate manipulations or increases in pressure may cause perforation But usually the normal rectum and colon retain their integrity under conditions of rather remarkable physical stress It may be noted for instance that the pressure within the rectum may rise as high as 200 mm of mercury during defecation As is the case with all hollow organs resistance to rupture from internal pressure depends partly on adjustment of smooth muscle tension A sudden blast from a compressed air *hose playfully applied may rip open half* the large bowel

Mucosal abnormalities produced by enema tips and examination instruments are not uncommon and if diagnostic confusion is to be averted they must be recognized as such upon inspection Transanal automanipulation leading to rectal injury is a problem in the management of perverts and this is not an unusual means whereby prisoners obtain the benefits of hospitalization and escape from undesirable assignment Factitious proctitis can usually be diagnosed at a glance sigmoidoscopically by the configuration and disposition of the signs of injury *Erosions in linear streaks are found on* the anterior rectal wall growing larger and deeper as one proceeds upward from the anal canal They may end against the first Houston valve If they continue beyond *their* distribution becomes spotty The lesions show evidence of fresh or recent bleeding although ordinarily blood loss does not become serious in factitious proctitis The remainder of the mucosa is normal

When injury is limited to the mucosa healing proceeds quickly and without complication If permanent damage is done it usually takes the form of anal incontinence due to rupture of the sphincter

ANAL INFECTIONS

CRYPTITIS

The orificial apparatus of the rectum is a complicated anatomic and physiologic device which in many ways does not seem designed to discourage local infection There are the crypts or sinuses of Morgagni between the columns of Morgagni (Fig 163) which are directed like scoops towards the oncoming fecal mass and which cannot help

diseases accompanied by urinary extravasation It is clear that discovery of one of these diseases in the patient who presents himself with a fistula changes the complexion of the therapeutic approach considerably Conversely development of a fistula during the course of a more extensive disease process may necessitate change in plans for management of the latter

There is no sex preference for these infections The majority develop during middle age Fistulas demonstrate many anatomic variations depending on the point of initiation of the infection and the local anatomy of the muscle masses and of the fascial planes and connections in the particular area

The foremost responsibility of the gastroenterologist who encounters an anorectal fistula is to make a search for associated disease and to see to it that only most conservative treatment is used for the fistula if ulcerative colitis is present Patients with ulcerative colitis are notoriously intolerant to anorectal surgery This of course means that the fistula cannot be managed at all satisfactorily for only radical surgical measures will eradicate this lesion Nevertheless the ulcerative colitis patient is better off with his fistula than with surgical therapy for it Abscesses which present at the surface should be drained by simple incision They probably will not heal as long as the colitis is active but at least they will drain and often this will convert a burrowing abscess or sinus into a more predictable fistula

ANAL CONDYLOMAS

Condyloma acuminatum is probably due to a virus at least the lesions are contagious and autoinoculable There is often association with gonorrhea syphilis and trichomoniasis vaginalis and there is still confusion over just what venereal connections there may be It is clear that infection may be acquired during coitus but not all cases can be explained this way

Condyloma acuminatum of the perianal area is not as common as the penile and vulvar lesions The growth usually occurs as a partially encircling irregular flattened vegetation at the anal verge The brown or dark yellow surface is filiform or papilliform It is moist and often crusted Most of the condyloma is sessile but parts may have short peduncles Growth may be very rapid especially during pregnancy but in most cases the lesion becomes quite static once it has formed

The complaint is usually that of the growth itself The patient sometimes has not recognized the presence of his condyloma or he may believe he has hemorrhoids The moisture of the lesion may cause irritation Simple inspection provides a specific diagnosis in almost all cases (Fig 168) Biopsy specimens should be taken for confirmation although the possibility of confusing condyloma with carcinoma is remote

Treatment by local use of podophyllin is eminently satisfactory All of the lesion must be removed by the applications if recurrence is to be prevented and even then reinfection may occur quickly from a sex partner because no immunity develops The lesion is painted thoroughly with a 25 per cent solution of podophyllin resin in tincture of benzoin carefully avoiding contact with uninvolved skin When the solution has dried the whole area is dusted with powder and the anal cleft is kept open with a layer of cotton The patient is instructed to wash the area thoroughly eight hours later Anal condylomas do not respond quite as quickly as do penile and vulvar condylomas Sometimes one application causes eradication of the lesion but more often a second or third treatment must be carried out at 10 day intervals There are no complications to podophyllin therapy

HEMORRHOIDS

Hemorrhoids (St Fiacre s disease) are as well known as any gastroenterologic disease and this has apparently been true since the beginning of medical scription They are common lesions indeed but routine anorectal examinations show that only a

split This may quickly become an ulcer through necrosis at its margins The tissues in the anal region are most firmly fixed posteriorly which is perhaps the reason for the usual site of injury Cryptitis plays its part in discouraging efforts of the minor lesion to heal through the pectenosis or underlying fibrosis which it has previously caused In other cases there is no surface injury but fissures are formed as a result of rupture of a strangulated crypt abscess through the anal mucosa Whether the mucosa is injured on its surface or from beneath resulting edema and reaction tend to encourage hypertrophy of the papilla at the fissure s inner end and formation of a sentinel tag at its outer end Persistence of infection progressive fibrosis at its base and continuous muscular activity in the area are the factors which encourage chronicity The main complications are anal stricture and fistula formation

Clinically and pathologically the lesions may present as simple acute ulcers subacute fissures which have penetrated to the fascia of the anal muscle or the more familiar chronic fissures which are characterized by chronic infection and inadequate tissue drainage In all the important symptom is acute spasmodic pain particularly upon defecation Fissure is generally the most painful of perineal lesions The anal sphincter is always spastic which adds to the pain Constipation born of fear usually develops Bleeding is only slight with bright blood on the surface of the stool and spotting of the clothing Various genitourinary symptoms such as dysuria and dyspareunia are common

Examination is not easy the problems being the patient s local pain and the spasticity of the anal sphincter By spreading the area with firmness one can usually see the end of the fissure as well as the sentinel tag from the outside Anoscopic examination is best carried out after local block anesthesia but local application of a water soluble surface anesthetic is good enough in most cases The rest of the fissure with its associated papilla is easily inspected if some degree of anal relaxation is obtained

Simple acute anal ulcers or fissures sometimes heal spontaneously but they are likely to break down later with eventual formation of a chronic lesion For this reason early surgical treatment is considered desirable by many experienced proctologists Unfortunately the most skillful surgical management is followed by recurrence in many cases and it is fair to classify anal fissure among the most difficult of surgical lesions If conservative treatment should be chosen for a mild case the important measures are bowel control anesthetic suppositories sitz baths and mild dilatations Surgical therapy usually consists of radical excision of all diseased tissue with complete division of the external sphincter and the contracting pectenosis Many variations of both principle and technic are continuously being suggested

ANORECTAL FISTULAS AND ABSCESSES

These are clearly surgical diseases from start to finish but it may be permissible to point out a few features here Abscess and fistula are best thought of together the latter being a stage of the former although not inevitably destined to break through as an open tract Infection beginning in the crypts of Morgagni is the start of most Tuberculosis causes no more than 3 or 4 per cent and former warnings about the probable presence of tuberculosis somewhere when a patient is found to have an abscess in this area no longer seem to apply Carcinoma of the rectal ampulla or anus is responsible for about 2 per cent of all fistulas Perhaps there are many other causes but from here on it is difficult to know which are merely associated with fistulas and which have an actual etiologic connection In any event it is especially important to understand that fistulas in the anorectal area are common in patients with ulcerative colitis regional enteritis lymphogranuloma venereum carcinoma of the colon chronic infections of the female pelvis diverticulitis of the colon chronic prostatic infection and

canal is adherent over the communicating veins there is a depression between the two ends of an interno-external hemorrhoid

CLINICAL ASPECTS

Although simple external hemorrhoids are not very important clinically their complications may be the source of great nuisance Chronic infection via the crypts is not uncommon and with it comes pain and itching Itching may also be the result of irritation by associated crypt drainage External hemorrhoids cause most trouble when they become thrombosed This thrombosis actually represents rupture of a dilated vein with hemorrhage and then clotting within the subcutaneous connective tissue This is a very painful event Occasionally it is followed by acute infection and fistula formation may be the result

Internal hemorrhoids are likely to cause more serious trouble although they are much less apt to produce pain When uncomplicated they are responsible for no more than vague discomfort Bleeding is the most frequent complication This is usually either a slow chronic form of blood loss or mere periodic spotting but lively hemorrhage may occur from time to time Iron deficiency anemia is not rare and sometimes its origin may at first be obscure because the patient has not noticed the bleeding Cryptitis is a common accompaniment of internal hemorrhoids and the local inflammation plus normal wear and tear probably accounts for the bleeding When the masses become large stool passage eventually causes their prolapse through the anal canal At first a prolapsing internal hemorrhoid reduces itself immediately following its peranal migration As stretching and relaxation progress reduction no longer occurs and the patient must make manual replacement Finally the hemorrhoid may remain permanently prolapsed It becomes infected ulcerated and thrombosed

Diagnosis is made by inspection externally and anoscopically (Fig 169) Internal hemorrhoids cannot be recognized by palpation unless there has been hemorrhage into their substance or unless there has been considerable thickening of the overlying mucosa It hardly need be emphasized that after hemorrhoids have been found thorough examination of the anal area rectum and sigmoid must be made The hemorrhoids may be the least important disease present

TREATMENT

Most hemorrhoids do not require active therapy For occasional discomfort or mild bleeding regular use of astringent suppositories is most satisfactory Treatment of

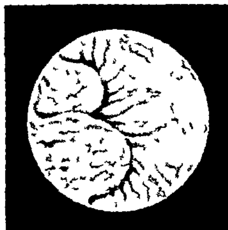


Fig 169 Anoscopic appearance of internal hemorrhoids

associated disease particularly cryptitis and papillitis is necessary Injection treatment of uninfected internal hemorrhoids continues to be a useful measure particularly for reducing their size and controlling bleeding At least temporary help results in most cases It is accomplished by injecting a sclerosing solution into or just above each hemorrhoid This technic of obliteration through fibrosis is a precise one not to be attempted unless the operator has had training in the procedure Surgical extirpation is the most definitive means of treatment for both internal and external hemorrhoids although recurrence after a few years have passed is not unusual Again the warning must be made that the patient with ulcerative colitis must

small proportion ever become symptomatic enough to lead people to seek medical help All ages are affected although hemorrhoids are very rare in infants and distinctly unusual before the age of 12 years Most first make their appearance during early adult life and cause most trouble during middle life The upright posture of the human being has something to do with etiology and for the most part some congenital weakness seems to be the important factor in determining who will become affected Only occasionally as in the case of dentists does one recognize an occupation which might predispose to hemorrhoids It does not seem to make very much difference whether a person has led an unusually active or a sedentary existence As a sign of portal hypertension the presence of hemorrhoids is most disappointing even though the superior hemorrhoidal vein is the start of the inferior mesenteric vein A significant portion of patients with ulcerative colitis have hemorrhoids and many others give a history of hemorrhoidectomy immediately preceding the first symptoms of colitis

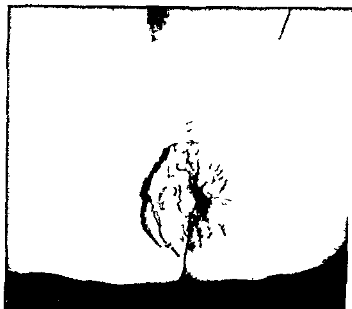


Fig 168 Anal condyloma

Hemorrhoids are conglomerate masses of dilated submucosal or subcutaneous venules and unchanged arterioles accompanied by a variable degree of fibrosis and chronic infection The amount of venous congestion and therefore size of the masses vary considerably from time to time Internal hemorrhoids represent varicose swellings of the radicles of the superior hemorrhoidal vein and they lie in the rectal submucosa just above the pectinate line They are thus close to the crypts and their overlying mucosa makes up in part the region of the columns of Morgagni The common circumferential locations for internal hemorrhoid development are the left posterior quadrant the right anterior quadrant and the right posterior quadrant Lesions at these sites are the primary internal hemorrhoids Secondary internal hemorrhoids up to the number of five may develop

External hemorrhoids represent varicosities of the external hemorrhoidal venous plexus They develop under the true skin in the perianal space at the anal verge The internal and external venous plexi communicate so that combined or interno external hemorrhoids are common Because the mucosa of the anal

granuloma due to submucosal deposition of foreign oil Trauma during administration of oil retention enemas is responsible for some but most are secondary to treatment of internal hemorrhoids or of rectal prolapse by injection of oily sclerosing fluid They are found just beyond the anal canal or higher on the anterior rectal wall Other intramural granulomas as well as the neo plasms are discussed in connection with the colon

Most pararectal granulomas take their origin from penetrating infection which has begun at the anorectal junction and there fore usually represent the terminus of a sinus tract or a growth along a fistula They are commonly associated with anal fissure cryptitis or some other more obvious disease Occasionally amebomas or more active chronic amebic abscesses develop in the pararectal tissues as a result of transmural penetration They may become very large

Although they are not common pararectal tumors may have a great variety of forms and histopathologic types Most lie in the retro rectal space Among congenital lesions there are ectopic pelvic kidneys meningoceles and chordomas A retrorectal teratoma (Middel dorpf tumor) may perforate into the rectum so that teeth or hair masses are passed in the stool or recognized at proctoscopy Pelvic bone tumors of many varieties may impinge on the rectum The retrorectal area is not an excessively rare site for development of schwannomas ependymomas and neurofibro mas Vascular tumors and the lymphomas on the other hand appear to be very rare in this position Blumer s shelf and its signifi cance have been mentioned elsewhere

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not have surgical treatment of his hemorrhoids A great many surgical technics for hemorrhoidectomy have been proposed and the gastroenterologist sometimes finds that each of his patients has been handled a little differently from the last

NEOPLASMS AND OTHER MASSES

CARCINOMA OF THE ANUS

Only about 1 of 50 cancers of the lower bowel develops in the anal canal The relative rarity of the lesion seems to explain some rather major gaps in understanding of its behavior particularly the factors governing prognosis Approximately two thirds of the patients are women Most cases are diagnosed when the patients are in the sixth decade of life although occasionally the disease is encountered in children

These are squamous cell carcinomas They tend to encircle the anal canal Although invasion laterally into the sphincter muscle occurs early most of the local growth follows the rectum upwards Extension tends to remain within the wall of the rectum Invasion of the bladder and prostate or vagina occurs only late in the course if at all Lymphatic spread too follows an upward path into the pelvic nodes The perirectal mesocolic and lateral pelvic node groups are the important metastatic sites The inguinal nodes become involved rather late and by the time of operation carcinoma is found here in only about 10 per cent of the cases Blood borne metastases are distinctly uncommon and in only about 10 per cent of cases studied at autopsy can carcinoma be found in the liver

All anal troubles make themselves known to the patient quickly and carcinoma is no exception Perhaps one s impressions about the late metastatic tendency are flavored by relatively early diagnosis The patient complains mainly of pain and bleeding The stools may be narrow or otherwise deformed unlike the situation in cancer of the rectum and colon Local examination usually permits a confident diagnosis and the taking of a biopsy specimen will confirm it

In spite of the favorable aspects of early symptoms easy diagnosis and late metastasis the prognosis of carcinoma of the anus is not good There is confusing unpredictability in the length of survival regardless of the type of treatment used Following radical operative treatment perhaps one can expect a five year survival rate of about 35 per cent Adequate management usually calls for excision of the anus rectum sigmoid perianal skin levator ani muscles pelvic fascia and posterior vaginal wall Bilateral inguinal node dissection is usually done although if metastases are found here the prognosis is poor There is some disagreement over the advisability of radiation therapy but it cannot be shown that addition of radiation improves surgical results More important local postirradiation pain in some patients is so severe that to them the cancer may seem rather desirable

INTRAMURAL AND PARARECTAL MASSES

It is often difficult even at operation to differentiate tumor masses which arise within the rectal wall from those which properly should be considered pararectal Because only in such diseases as pelvic kidney sacral tumor and fistulous retrorectal mass can the point be determined preoperatively the clinician must usually think of the two together Pararectal neoplasms often do not make their presence known until late in their development or until some complication supervenes Visualization is not as effective a way to detect small pararectal masses as is palpation Tiny masses particularly phleboliths and normal pararectal lymph nodes are not uncommon findings at digital examination of the rectum and question over their significance may leave one quite insecure Specific diagnosis can often be made only by histopathologic examination It is worth mentioning that many an experienced clinician has momentarily mistaken a vaginal tampon for an anterior wall tumor

The most common intramural granuloma which attains palpable size is the eleoma or

granuloma due to submucosal deposition of foreign oil Trauma during administration of oil retention enemas is responsible for some but most are secondary to treatment of internal hemorrhoids or of rectal prolapse by injection of oily sclerosing fluid They are found just beyond the anal canal or higher on the *anterior rectal wall* Other intramural granulomas as well as the neoplasms are discussed in connection with the colon

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CHAPTER 14

FOREIGN BODIES

A few clinicians gain a great deal of experience with gastrointestinal foreign bodies by virtue of endoscopic specialization or perhaps association with a penal institute To others the foreign body problem comes up only occasionally Then each case is likely to seem like a brand new clinical problem made hard by various individual features which always seem to make each patient s situation unique There are in addition some unique features about the foreign body problem as a whole First there usually is an air of panic sometimes generated by the patient usually by the parents in the case of a child or perhaps by institutional officials or even professional personnel themselves Secondly there is the badly prejudicial medical literature on the subject comprised largely of bizarre and sensational experiences with unusual forms of foreign body strangely acquired by strange patients Thirdly there is the realization evident to anyone who has read a medical book that foreign bodies behave in unpredictable ways and that some innocuous appearing objects may kill while swallowed razor blades may traverse the tract without harming

TYPES OF FOREIGN OBJECTS

A great variety of objects which should not be there find their way into the gastrointestinal tract and others which ordinarily are normal ingestants or normal or abnormal body products become as foreign bodies by virtue of abnormal behavior A useful classification might be as follows

I Peroral

  A Particulate matter leading to gastroconiosis

  B Particulate matter leading to immobile masses as in geophagia

- C Retained undissolved medicinal tablets
- D Hygroscopic gels which become immobilized
- E Concretions and precipitated masses
- F Bezoars
- G Bones husks pits and other natural objects which occur in food
- H Dentures deciduous teeth
- I Medical instruments and devices
- J Entirely foreign objects such as pins toy whistles

II Internal origin
- A Gallstones
- B Retained surgical sutures which penetrate the mucosa
- C Inspissated mucus masses
- D *Autoamputated polyps*
- E Fecal impactions and fecalomas
- F Masses of helminths

III Peranal
- A Medical instruments and devices
- B Entirely foreign objects

The clinical problem produced by each of these types has its own special characteristics The circumstances surrounding the establishment of the foreign body state the chronicity of foreign body sojourn potential dangers and means of treatment vary considerably Some of the classes are discussed in other chapters

OCCLUSION OF ESOPHAGUS BY SOFT MASSES

MEAT IMPACTIONS

Old people and especially those with an inadequate dental apparatus occasionally get a bolus of food caught in the ampullary portion of the esophagus *Sometimes a previously* occult esophageal stricture or tumor is responsible for impaction but usually the normal esophageal emptying mechanism is merely unable to move the material along Most such masses pass on after a little delay but if the bolus is composed of meat it often *does not Pork chops are the most* notorious offenders Meat impactions are a relatively common problem in old folks homes and *on geriatrics services This is an unspectacular* and poorly publicized problem and often the patient is not impressed by it all He often repeats

The condition is usually diagnosed easily from the history The patient reports that he suddenly became unable to swallow during a meal and that shortly there developed deep chest pain and salivation An elderly person often handles this by just waiting for a while Sometimes his friends or attendants merely notice that he has stopped appearing for meals Upon physical examination no swallowing sounds are heard Roentgenologically the responsibilities are *recognition* of the *foreign nature of* the obturating mass and detection of intrinsic disease which *may* have caused the arrest Whenever acute obstruction of the esophagus is suspected contrast fluoroscopy should be carried out with the use of a nonparticulate contrast medium If the patient is unable to tell of the suddenness of the obstructive episode or has not recognized the acuteness of the onset the whole mass may easily be misinterpreted as obstructing tumor at the cardia *Aspiration of the esophagus above* the obstruction which usually must be car*ried out before roentgenologic examination is* attempted seldom returns recognizable meat

Treatment may be effected either by transesophageoscopic removal of the meat or by chemical dissolution In most cases the former is preferable It is more certain and *it provides the opportunity to inspect the* esophagus at the site of impaction for stricture or other primary disease Furthermore should the meat *bolus contain* a spicule of bone it will be bared if the meat is dissolved *perhaps with injury to the esophageal wall* Transesophagoscopic removal of a meat plug is not a difficult matter It may or may not be tedious depending on the friability of the meat

Enzymatic dissolution of the meat mass *in situ* is a very useful technic when kyphosis precludes esophagoscopy or when for any reason esophagoscopy is not feasible Papain the crude fruit and leaf *juice of the American*

pawpaw tree contains a powerful crystalline proteolytic enzyme which is able to digest 35 times its own weight of lean meat down to amino acids Caroid the refined commercial preparation is widely used in cooking as a meat tenderizer For treating meat impaction the esophagus is aspirated of fluid above the obstruction and 10 ml of 5 per cent solution of Caroid are instilled Thereafter the patient drinks 5 ml of the solution every 15 minutes until the esophagus is clear This may take less than an hour or several hours

HYDROPHILIC COLLOIDS

Widespread use of the hydrophilic colloids for treatment of certain bowel problems usually constipation has created a unique new foreign body problem Several popular drugstore remedies contain them and they have largely replaced the chemical stimulators among prescribed laxatives Their virtue lies in their hygroscopic property and this causes the trouble For the most part they become important as esophagus pluggers Obstruction of the colon is very rare now that dispersible preparations have replaced the untreated colloids although any form may add to the bulk of fecal impactions The natural hydrophilic colloids are treated by combining them with dextrose which prevents their separating out and balling up in the bowel

If a hydrophilic colloid should become arrested in the distal esophagus it quickly forms a plug which the ampulla may be unable to expel *Pre existing obstructing disease of the distal esophagus increases the* possibility of arrest of course but most instances are encountered in people who have no esophageal lesion and who may have taken the offending preparation for months without difficulty The reasons as well as the prophylaxis are usually found in too rapid ingestion of the material and *insufficient intake of* water at the time When hygroscopic materials are used in tablet form the tablets must be taken individually and each followed by a few swallows of *water Preparations that are stirred into* water first must be taken in a lot of water and drunk immediately after preparation

When esophageal obstruction occurs the patient is immediately aware of the trouble He suddenly becomes unable to swallow and there is a heavy and often frightening pain deep in the chest The mass may suddenly pass on leaving only a little temporary discomfort but the plug is a progressively swelling one and it usually becomes tightly fixed All the problems of acute esophageal obstruction are created No swallowing sounds are heard upon examination Contrast fluoroscopy shows the plug but no characteristic form to its superior profile

Treatment necessitates transesophagoscopic removal of the mass bit by bit It cannot be removed by aspiration and of course no effort should be made to push it on through into the stomach For both the patient and the esophagoscopist evacuation of the plug is a tedious tiresome procedure No short cuts are known It is possible that eventually some substance will be found which when taken by mouth will disperse or soften the mass sufficiently so that it will pass on spontaneously At the moment there is some suggestion that Taka diastase may be such a substance

INTRAGASTRIC FOREIGN BODY PROBLEMS

PARTICULATE MATTER

Insensibly ingested insoluble particulate material may become embedded in the gastric mucosa with subsequent foreign body granuloma formation This is gastroconiosis The antrum is usually involved Metallic dust silica and especially medicinal Kaolin have been found to be etiologically important

Geophagia the eating of dirt is a common perversion among people in some parts of the world In the southeastern mountain area of this country it is encountered occasionally and because it is practiced in relative secrecy it may be more common than

generally realized In some societies the mores dictate the eating of sand when worms are seen in the stool and when certain other illnesses are evident Universally geophagia is one of the occasional perversions of preg nancy Most ingested dirt is no doubt passed with the food mass like any inert substance Sometimes however it collects in the stomach in large amounts and to a lesser extent in parts of the colon It remains entirely plastic without any tendency towards development of concretions A plain film of the patient s abdomen may then appear as though a large barium meal and a barium enema have been given Ordinarily dirt-eating causes no troubles but if the stomach fills up the pa tient may have discomfort anorexia and even tually cachexia Iron deficiency anemia is often found in these patients although stools usu ally do not contain blood Diagnosis may be suspected from the roentgenologic appear ances aspiration of samples of gastric con tents and study of the sediment from a stool which has been emulsified in water Treat ment through abstinence is often sufficient but this is difficult for the doctor to imple ment Oral use of one of the simple household detergent agents helps clear the material

TABLETS CONCRETIONS AND PRECIPITATES

Retained undissolved medicinal tablets may lie free in the stomach for many months particularly when there is hypochlorhydria or achlorhydria Calcium bismuth magne sium and sodium carbonates are common offenders The material tends to become ag glomerated into masses which soon turn dark brown or black The gastroscopic appearance is very much like that of the bezoars

Very rarely barium sulfate suspension ad ministered for roentgenologic purposes re mains in the stomach to become converted eventually to a roughly spherical concretion It may then be discovered by chance at a subsequent x ray study or it may suddenly move from the stomach and produce acute obstruction down in the small intestine

The chewing of asphalt is a fairly common habit among some city children and among asphalt workers When swallowed the masses usually pass on without trouble but occa sionally they remain in the stomach They may lie here for many months gradually be coming partially embedded in the mucosa They are particularly likely to cause mucosal damage *and often first come to someone s* attention only after a chronic gastric ulcer has developed

Alcoholics who take to drinking shellac and other alcoholic solutions of resinous ma terials often build up masses of precipitated resin in the stomach These may become very large sometimes as several poorly ad herent boli and sometimes as a single form fitting rather immobile mass along the greater curvature

In some instances of chronic partial pyloric obstruction or other cause for impaired gastric emptying masses of jelly like mucus of gastric origin may accumulate temporarily in the stomach They are able to accentuate the obstructive element but apparently do not do so very often If the patient should note a ball of the material in his vomitus he is likely to identify it as tissue The main problem created by the masses is roentgenologic misinterpretation as tumor Their mobility and the changing picture they produce ordi narily preclude the error

BEZOARS

Bezoars are gastric foreign bodies com posed of animal or vegetable material which accumulate either gradually over a long period or all at once and which regularly take on the shape of the stomach They have stimu lated lay curiosity and superstitious interest for centuries and perhaps have been over emphasized in the medical literature Except in persimmon growing areas they are rare in the human being Ruminant animals often develop them

About half of bezoars the world over are composed of hair from the patient s head These trichobezoars or pilobezoars gradually accumulate as a result of trichophagia Trich ophagia is not a rare habit among young girls having neurotic implications similar to those

of nail biting *It is no surprise therefore* to find that 90 per cent of people with trichobezoar are women and that about the same *proportion are less than 30 years old* when the diagnosis is made

The stomach seems singularly unable to expel hair *As the child eats more and more* it accumulates into a well woven and accurate cast of the stomach Whatever the color of the *patient s hair the mass is green brown* or black Often the interstices contain fat which has been trapped this side of its digestive enzymes Sometimes vegetable fibers also join the mass (trichophytobezoar) A very large bezoar may eventually form weighing a few pounds or more and extending for a short way into the duodenum Rarely do they extend up into the esophagus Sometimes a trichobezoar consists of a few separate hair balls opposed by faceted surfaces

Phytobezoars or those formed from fibrous vegetable material are more accidental in their inception than trichobezoars and in some cases they accumulate rapidly About 80 per cent of reported phytobezoars have been composed of fibrous material from the fruit of *Diospyros* spp which in this country is the persimmon Many other fibrous or otherwise resistant normal or unusual foods are physically able to behave in the same way— orange pulp citrus peelings figs blackberry *seeds nuts cherry pits and grape seeds* however as quickly formed loose agglomerations they tend to leave the stomach within hours or days of first becoming balled up They may cause temporary acute or incomplete obstruction on the way out but eventually they are passed The threat therefore of important small bowel obstruction by recently eaten vegetable material is not great although many cases have been reported some with perforation of the bowel It is probable that spontaneous disappearance of small quickly formed phytobezoars occurs often

Bezoars which become permanent residents of the stomach may cause no illness for a long long time or none at all Usually by the time a large *size is reached* the patient has developed anorexia some nausea mild dyspepsia and perhaps epigastric pain and vomiting Weight loss then develops and finally emaciation and even death may supervene *After a long* sojourn the mucosa develops a certain amount of surface injury Surgical experience has shown that the masses *may become adherent to and even embedded* in the mucosa One result is slow blood loss and chronic iron deficiency anemia Gross *hemorrhage is not common from the sec*ondary erosive gastritis but chronic gastric ulcer frequently develops in people with a *bezoar and then hemorrhage becomes* a fair possibility More than half of the true ulcers which develop in association with bezoars do not lie under the mass but on the lesser curvature of the pars media where direct contact injury is expected to be least Hyperplastic changes in the mucosa s surface cells have been described but no carcinogenic tendency has been noted Development of internal fistulas secondary to ulcer penetration seems to be rare Obstruction of the pylorus itself never seems to occur even though pieces may break off the main mass and cause obstruction farther down in the small bowel A bezoar may develop in the gastric stump following subtotal gastrectomy and then there is danger of obstruction at the stoma

Diagnosis is sometimes suggested by the history as by a mother s recounting of the *trichophagia habit or by the story of a* persimmon bust Sometimes masses of hair are recognized in the stool or *vomitus is found to contain hair or part of a* phytobezoar A bezoar which is large enough to cause symptoms is usually large enough to be felt upon abdominal palpation Its form is exactly that of the stomach A sensation of crepitation has been reported a few times Plain x ray films of the abdomen often show the mass and if tiny areas of relative radiolucency are scattered through it bezoar may be diagnosed with some assurance When the patient takes a *small swallow of barium suspension* it spreads out quickly in a thin layer over the mass as if the surface has particularly good wetting properties Gastroscopic examination has proved to be very helpful for both di

agnosis and evaluation of secondary mucosal damage (Fig 170) Gastroscopically individual fibers as such are not discernible The object has the appearance of a dark or black gelatinous mass Persimmon bezoars and many trichobezoars are tar black

Treatment for all cases is simple gastrotomy with removal of the mass plus spoken measures to prevent recurrence Although a great many bezoars cause no trouble presumably most are discovered because they do Those that do not probably wi l for resident bezoars



Fig 170 Gastroscopic view of proximal portion of trichobezoar

are growing lesions constantly adding to their bulk through accretion Prophylaxis against anemia cachexia and the other complications is a major consideration in adopting a routine surgical approach

SWALLOWED HARD OBJECTS

BEHAVIOR OF PATIENTS AND OBJECTS

Several classes of people become involved in the swallowin of hard objects which are foreign to the gastrointestinal tract First there is the infant or child who by chance or out of curiosity swallows little things which come within his grasp Boys are more likely to get into this sort of mischief than girls No distinction is made by the child between dangerous and relatively innocuous objects and what he swallows depends on what becomes available Then there are adults who quite by accident fail to recognize the presence of a harmful object in a bolus before it has been swallowed Meat and fish bones are special threats Some professions and skills such as tailoring and roofing call for the holding of small objects in the mouth or between the lips and subsequent events often show that some have been swallowed at intervals quite without the patient s realization. Girls and women often hold bobby pins and similar paraphernalia between the lips while fixing their hair Dental prostheses are not swallowed as often as might be feared from their availability status but when they are they cause especially difficult problems because of their large size the frequency with which they are fitted with metal prongs and the radiolucency of the nonmetallic portions Some adults as side show performers are vocational foreign body swallowers They are likely to choose very dangerous appearing objects such as broken glass and razor blades The foreign body problem with psychotic patients is well known These are people who use no judgment at all in their ingestions and consequently they are particularly prone to harm themselves Because they appear to have no secondary gain in mind their actions are not predictable The fad ingestionists who caught in some peculiar mass hysteria of civilized life participate in competitive ingestion games have well earned a separate psychoneurotic category for themselves The most difficult of foreign body situations is created by the epidemics which are sometimes encountered among inmates of penal institutions and among other groups who have for secondary gain escape from incarceration or unpleasant tasks The problem in penal institutions is of course not always epidemic but if it becomes noised about that one member of the group has been hospitalized for say swallowing a nail the local foreign body situation often quickly reaches acute proportions

Given a handful of variously shaped and

sized objects one would be hard put to guess which would traverse the gastrointestinal tract without difficulty and which would become incarcerated along the way Armed with knowledge of the precise size shape and composition of a swallowed foreign body it is not possible to make a reliable estimation of the probable rate of transit or to judge *the potential risk of damage* An open safety pin may appear in the stool in 18 hours while a small nutshell may stick in the esophagus and lead to death through perforation and mediastinitis

Passage down the esophagus is of course by far the most hazardous part of the trip The great majority of objects which reach the stomach pass on through the rest of the tract easily The problem in the esophagus is that a *large part of the transit is hap*hazard with relatively little rejective action exerted by the organ This is a passive and inadaptable part of the gastrointestinal tract incapable either of very much distention ahead of a wide object or of effective local muscular action to turn away a sharp one *Although even very slow movement through* the organ is ordinarily safe enough once actual arrest has occurred the chance of eventual spontaneous passage is not good Static segmental spasm develops about the object followed quickly by edema secondary to regional trauma and entrapment becomes firm

The cricopharyngeus muscle is active in preventing passage of foreign bodies but also actively incarcerates them The segment immediately below it is the most common site of arrest The hypopharynx and cervical esophagus are naturally flattened in the anteroposterior direction *so that flat bodies caught* here always come to lie in the coronal plane Within the esophagus itself the ampulla is most likely to be the site of arrest This seems partly due to the relative narrowing above the diaphragm and partly to the fact that the ampulla converts the oncoming esophageal peristaltic wave to a simple bellows like contraction Ordinarily if the foreign body is elongated it comes to rest lying in the long axis of the esophagus but this may not be so if it has sharp points which become snagged along the way (Fig 171) Rather often previously unrecognized esophageal strictures and tumors are responsible for catching foreign bodies and following removal of the object this possibility must always be investigated

Perforation leading to mediastinitis is the great threat of the hard foreign body to the esophagus Perforation is much more of a danger at this level than farther down in the gastrointestinal tract The cervical and upper thoracic parts of the esophagus are most



FIG 171 Esophagoscopic view of denture incarcerated at esophagegal ampulla

vulnerable It is not only the pointed or sharp foreign body which may perforate and the *potential danger cannot be judged from* roentgenologic estimation of the object s configuration Sometimes quite soft foreign bodies such as small fish bones pass through the esophageal wall Mediastinitis one of the most serious of all infections usually is a consequence of therapeutic neglect Less com*monly there is chronic perforation* migration of the object through the tissues with sinus formation erosion into the aorta or other large vessel or development of an esophagotracheal fistula Any neglected esophageal foreign body whether it eventually perforates or not will cause stricture after a while The esophagus is a singularly unprotected organ

Insoluble foreign bodies may lie free in the gastric lumen for a long time and then

perhaps after weeks have gone by suddenly be picked up by the natural propulsive activities and carried quickly on through the bowel Almost always the objects are found to rest rather high on the greater curvature and long objects such as thermometers tend to stand up vertically in the pars media Here they may remain day after day When gastroscopic examination is made in such cases it is found that the object is lying free on the mucosa and entrapment by rugae which may be suspected from the long sojourn is not found Very rarely objects become impacted in the gastric wall or tiny pointed ones such as pins may enter the stomach or bowel wall and form a little foreign body tumor Surface damage seems to depend not on a foreign object s shape or sharpness but on the length of sojourn One is usually surprised to find no more than mild local hyperemia and perhaps some excess mucus Erosion and actual ulceration can occur but are not common Important bleeding is rare That it is possible for foreign body reaction to lead to true tumor formation in the stomach is known from the behavior of the nematode *Spiroptera neoplastica* in mice Such a phenomenon is not believed to occur in the human

Within the small intestine there is more evidence of active manipulation of foreign bodies The wall has a rejection reflex whereby pointed objects tend to be withdrawn when they run into the mucosa Apparently it is for this reason that pointed foreign bodies travel *more slowly through the small bowel than do* rounded ones Naturally this reflex affords only relative protection and most objects which migrate through the bowel wall do so at this level The dangerous areas are the descending duodenum duodenojejunal junction and terminal ileum Perforation may be attended by all the acute clinical manifestations and therapeutic problems encountered *in acute rupture of a duodenal ulcer It may* on the other hand occur without causing symptoms and in fact perforation by very thin objects is quite likely to be slow with very little extraenteric extension of infection The object may end up in the kidney or other bizarre location This phenomenon usually occurs in people who work while holding pins or needles between their lips and it is occasionally found that a great number insensibly swallowed have migrated widely through the tissues of the torso without causing any sign of illness The presence of Meckel s diverticulum imposes a relative hazard of perforation and toothpicks in particular are likely to get caught here and be forced through the wall Other small bowel diverticula do not seem to pose this threat for reasons unknown

Intestinal obstruction perhaps followed by perforation is as common a complication as is primary perforation It is a source of amazement to find how often very large or very long foreign bodies pass quickly through the small intestine while some relatively small spherical objects such as gallstones frequently cause obstruction The descending portion of the duodenum the region of the ligament of Treitz and especially the ileocecal valve are the common points of obstruction

The appendix is not often involved in the foreign body problem except as helminths and fecaliths may act to produce obstruction Occasionally tiny radiopaque objects such as bird shot are discovered here quite unexpectedly during roentgenologic examination (Fig 172) They can cause acute appendicitis if they contribute to appendiceal obstruction The homely advice of mothers that grape *seeds should not be swallowed because they* may drop down into the appendix is not entirely without foundation

Foreign bodies cause less trouble in the large bowel than elsewhere Very small ones such as toothbrush bristles may become hung up in the anal crypts and cause trouble here but in general even sharp swallowed foreign bodies negotiate the anal canal with ease It *is not unusual to find* that the stool of a criminal or psychopath who has swallowed pieces of broken glass contains several pieces side by side but they always seem to be buried effectively and sigmoidoscopy immediately following defecation fails to reveal in

jury Perhaps the greatest problem as far as the large bowel is concerned is the rare case of perforation in the person for whom the presence of a foreign body is not even remotely suspected Often the foreign body is radiolucent and the course of events becomes clarified only when an object such as

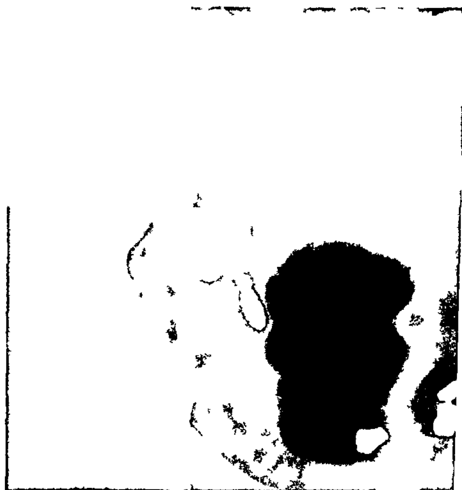


FIG 172 The tip of this appendix is filled with bird shot ingested insensibly by an enthusiastic quail hunter The shot had caused no troubles and were discovered by surprise during urography

a toothpick or piece of glass is found in the peritoneal soilage during emergency laparotomy Sharp pointed objects are unquestionable hazards in both the small and the large bowels and at times they may be forced quickly through the wall by peristaltic activity No attempt is being made to minimize this as a potentiality but it is necessary to be impressed by the efficiency of the trigger mechanism whereby local bowel contraction causes rejection of the stimulating object upon contact

DIAGNOSIS

It can freely be assumed that many or even most people swallow foreign bodies from time to time and no one knows anything about it Often enough chance x ray films reveal foreign radiopaque objects in the bowel but unless a complication develops the great majority pass unnoticed Very often the reverse aspect of the problem presents itself in the form of the patient who is sure a foreign body has been swallowed but in whom no evidence of the accident can be found The

patient is usually a middle aged woman and the suspected body a bone The complaint is that while eating meat or fish a scratch was felt in the back of the throat too late to permit expulsion of the bolus The sensation that there is a bone in the throat is very convincing to the patient This creates a difficult problem for the clinician because odynophagia is the important complaint when an object has truly become caught in the hypopharynx The dilemma can be approached only through direct hypopharyngoscopy detailed roentgenographic study and sometimes esophagoscopy even though the promise of positive results seems to be slight The complaints persist in spite of normal examinations and the insecurity of the situation is felt by all Diagnostic investigation however can hardly be pushed any further Approximately 5 per cent of patients studied because of dysphagia are found to have a foreign body as the cause On the other hand only about one quarter or one third of persons who are referred with the diagnosis of suspected foreign body are found to have one

The important subjective diagnostic hint of arrest of a foreign body in the esophagus is dysphagia not odynophagia It is very unusual to find that a swallowed object has actually scratched the throat or otherwise left any injury which would make swallowing painful in the neck area Lower down in the esophagus there may be discomfort as a result of esophageal distention secondary to obstruction but this does not amount to much Within the stomach and bowel a foreign body causes no symptoms unless a complication develops

A great deal of diagnostic emphasis must be placed on roentgenologic evaluation In addition to its presence a radiopaque foreign body must be studied for precise position configuration size and multiplicity Even though Mother describes the object that Baby just swallowed as being quite innocuous the chances are good that an x ray film will show that Baby has unsuspectedly been swallowing other things too It is unfortunate that so many important foreign bodies are radiolucent and that others like dental prostheses are partly radiolucent and partly radiopaque Radiologic profile study of the thickness of the prevertebral soft tissue is important for diagnosing retropharyngeal perforation with infection In the esophagus an arrested radiolucent object causes mechanical spastic and edematous obstruction and its position can easily be determined in most cases by roentgenologic study after the patient has swallowed a barium filled capsule or a barium soaked ball of cotton Because of imminency of esophagoscopic examination barium suspension should not be given but a swallow of Lipiodol may provide helpful information Beyond the esophagus a radiolucent swallowed foreign body cannot be followed unless there should be bowel obstruction or perforation

Hypopharyngoscopy and esophagoscopy rather frequently reveal the presence of a foreign body after roentgenologic study has been normal The hypopharynx and the area in and just below the cricopharyngeus muscle are difficult to examine for small foreign bodies because of the complex mucosal foldings and spastic tendencies Usually one must spend many minutes going back and forth over the area before he can be sure no foreign object is present

TREATMENT

Every hard foreign body which has become arrested in the esophagus must be removed transesophagoscopically just as soon as its presence is recognized The experts say that almost anything that can be swallowed can be withdrawn with the help of the esophagoscope The mechanical problems involved and potential dangers to the patient are well known This is not a proper procedure for the gastroenterologist unless he has had special training in this otolaryngologic subspecialty Better that a few hours be lost with the dangers entailed in that than a clumsy attempt at transesophagoscopic extirpation It will be mentioned for historical reasons only in order not to offend the gastroenterologic mind that the day has long passed when it was defensible to probe blindly the esophagus

which contained a foreign body Also it may be noted there is no place for the use of magnets in removal of ferrous objects from the esophagus

Once the object has reached the stomach it can be watched almost indefinitely, with anticipation that it will eventually pass spontaneously There are rare exceptions to the general rule that anything that is able to pass the cricopharyngeus muscle and cardia can and usually does negotiate the rest of the tract without difficulty The important ones are the very long objects such as corset stays table knives and new lead pencils In such instances the upper end of the object often remains for some time within the esophagus whence it may be withdrawn with the help of the esophagoscope In the ordinary case of intragastric foreign body perhaps the greatest problem in management is the panic which is regularly displayed by the patient s parents This can do more harm than the foreign body especially should it lead the parent to administer a purge in spite of professional advice But if all concerned can refrain from becoming nervous the object will almost always pass on after a while Films need not be taken to check the position of a radiopaque object more than once a week and at that the gesture is motivated mainly by curiosity Unless there should by chance be incarceration in the pyloric canal or unless there should be bleeding—both remote possibilities—operative intervention is not indicated

When the object reaches the duodenum or rest of the small bowel the therapeutic problem becomes quite different Now progressive movement down the bowel must be insisted upon if a conservative attitude is to prevail This can be judged satisfactorily by daily roentgenograms when the object is radiopaque When it is not one can only keep close clinical contact to detect immediately the early symptoms and signs of obstruction or perforation If a foreign body remains stationary in the small bowel for 48 hours one must usually prepare for laparotomy and enterotomy The reason of course is that clinical experience has proved that any hard foreign body whatever its configuration is likely to erode or by other means to pass through the small intestinal wall if it remains in one spot for more than two days There is unfortunately no way to predict which will do so and which will suddenly start forward motion again It is worth noting that the doctor with the greatest foreign body experience is likely to be the one who favors the greatest conservatism but the laudability of conservatism ends within a few days in this situation

Once past the ileocecal valve the body moves quickly on It is carried passively with the feces and if the patient is constipated it may remain in one position for a day or so but damage is not to be anticipated Complications during migration through the colon are rare It is most unusual for operative intervention to become necessary The indications are the symptoms and signs of perforation

RECTAL FOREIGN BODIES

Sometimes clinical thermometers and enema tips become lost in the rectum This is a simple matter easily managed by sigmoidoscopic recovery Spontaneous passage may be quicker than the sigmoidoscopist

The important problem is created when foreign objects are forced into the rectum and lost beyond the anal sphincter as an act of perversion or malicious attack The startling size of objects which are sometimes used in this way is well known During the act the sphincter may be torn and the rectum perforated Rarely the object may come to lie free in the peritoneal cavity Foreign bodies which are so large that they cannot be expelled easily have a tendency to migrate upward into the sigmoid or higher

All objects which have been forced through the anus should be removed with the sigmoidoscope if that is possible Purgation is contraindicated because of the damage which may be done by the object itself and because of the danger of acute dilatation and even perforation should the object prove to be immobile Varied and ingenious manipu

lative means are often required for removal including the fashioning of special snares packing thin glass objects in gauze and breaking them and devising miniature obstetrical forceps for delivery Vacuum plays a larger part in preventing recovery than one might guess considering the flaccidity of the rectal wall and for objects such as jars and bottles it often pays to drill a small hole in the bottom before attempting extraction The greatest problem by far in all the tedious manipulations which one must often go through is the continuous slipping of the object higher in the rectum

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CHAPTER 15

THE LIVER

INTRODUCTION

The liver is characterized by physiologic complexity and anatomic simplicity The former has been responsible for gradual dissemination of primary interest in the organ among the hematologists metabolists endocrinologists and others This has led during the past 15 years to a great many particularly important basic biochemical contributions which might have escaped the gastroenterologist for years to come It has also nurtured the strange quasi scientific pseudoclinical specialty field of neohepatology It has most unfortunately turned young internists away from what the patient has to say and what he has to show It has engendered a frightening tendency to measure the patient by numbers on laboratory slips Something of a tragedy is created by the fact that the results of liver function tests can be expressed in terms of numbers while the patient s history cannot If the gastroenterologist has a special responsibility these days it might be the responsibility of showing that it is still true that the patient is more important to his illness than is his liver chemistry

The purely local clinical manifestations of liver disease concern liver pain size configuration consistency and friction rubs For a solid organ the diseased liver is able to demonstrate remarkable day to day variations in these features As a result the younger clinician is likely to become confounded by unexplainable changes in its physical manifestations and direct his attention to the seemingly more secure laboratory approach which is wrong Liver pain is especially difficult to evaluate and if there is neglect of the potential help it may furnish it is because precise patterns are not encountered For one thing as a solid organ the liver cannot display the rhythms of muscle pain which are

so helpful in studying bowel pain For an other thing its intraperitoneal position makes the pain of peritoneal stretch its main subjective signal but its nonmesenteric attachment makes this signal behave differently from most intra abdominal stretch pain Furthermore possibly because the nerve supply to and from the liver and its capsule is diversified among fibers arising from T 7 8 9 and 10 bilaterally both vagus nerves and branches of the right phrenic nerve pain locations and referrals are variable from time to time and from patient to patient But still liver pain becomes easily comprehensible to the clinician if he pays enough attention to it—more than any other type of abdominal pain it must be learned at the bedside Its general features as well as the physical manifestations of liver disease will be mentioned under the specific diseases

LIVER FUNCTION TESTS

Considering the amount of thought and effort which have been put into their development the available liver function tests (a misnomer of sorts) furnish a disappointing amount of help in the practice of gastroenterology The reasons are evident The liver is an organ of many functions and there is no way to measure the efficiency of most One a few or several may be disturbed by liver disease This depends not only on the type of the disease but also on its stage from moment to moment Furthermore abnormalities which occur in other organs may influence tests which are used to measure liver functions sometimes because there are secondary effects on the liver but mostly because some of these functions are carried out or influenced by the other organs—kidneys bone thyroid and formed blood elements Heart failure rheumatoid arthritis malaria and brucellosis are examples of diseases of other systems which rather regularly influence the results of certain liver function tests A major factor adding to ineffectiveness of liver function tests is the fact that as in all biologic areas there are individual variations in the normal liver activities and a certain liver disease in one person does not behave the same way as it does in another person As so often happens in medical mensuration the problem is not what constitutes abnormality but what the limits of normal are Frequency distributions of the various normal results and values must be thought of in terms of bell curves and a portion of normal people will show a response to each test which is beyond the normal range Thus about one normal person in a hundred has a total serum bilirubin level of 1 5 mg per 100 ml and if he should become jaundiced it would be a mistake to expect his serum bilirubin level ever to return to normal

For these reasons there are three general rules for the use of liver function tests if they are to give useful diagnostic information several must be used in combination if they are to furnish information which will be helpful in the management of the patient they must be repeated at frequent intervals and if they are not to prove a disservice to the patient the doctor must not take the results too seriously The practice of gastroenterology would be made more difficult if the liver function tests were removed from the scene but only a small proportion of patients with liver disease would suffer thereby

The function tests which one will use will be governed by these rules and of course by the specific nature of the clinical problems encountered In addition usage will be dictated to some extent by expediency or actual availability of the tests Through experience gained by time and wide use however there has been a degree of spontaneous standardization among laboratories throughout the country on certain tests which physicians find most useful There are not as many tests as there once were and results in one laboratory mean about the same as they do in another laboratory

The tests which are thought to be useful may be classified as follows

I Tests which depend mainly upon biliary excretion

A Serum bilirubin 1 minute and total

(sometimes the icteric index must be used as a substitute)

B Urine urobilinogen excretion
C Bromsulfalein retention
D Blood cholesterol level
E Blood alkaline phosphatase activity
F Urine bilirubin (bile)

II Tests which are largely independent of biliary excretion

A Serum albumin and globulin levels
B Prothrombin activity and response to vitamin K supplementation
C Blood urea nitrogen vs nonprotein nitrogen concentrations
D Cephalin cholesterol flocculation
E Thymol turbidity
F Cholesterol esterification

Because of differential diagnostic problems created by hemolytic processes certain hematologic tests must frequently be utilized These might involve investigation of anemia itself reticulocyte response red cell configuration red cell fragility red cell survival and a great many immunologic reactions

It is not the present intention to describe the laboratory technics for carrying out the liver function tests or to discuss their interpretation apart from the specific diseases themselves General rules regarding interpretation necessarily make a mechanical matter out of diagnostic aids which have too little of the quality of precision to permit mechanization

NEEDLE BIOPSY OF THE LIVER

Development of a reasonably safe and efficient method for percutaneous biopsy of the liver has led during the past decade to tremendous advances in both the technic of morphologic diagnosis and the understanding of the dynamics of liver histopathology Needle biopsy has become a routine procedure in many parts of the world for assisting in diagnosis of jaundice problems furnishing information on tumor type in instances of hepatic metastases following the progress of acute liver diseases evaluating the degree of hepatic damage in subclinical schistosomiasis and in many other practical clinical problems The information obtained however fills only one small fenestra in the diagnostic picture The degree of abnormality observed may be at odds with the clinical facts and at times very much so Again knowledge of the liver s histopathology tells but a little about the patient s whole problem

There are many individual preferences in the actual technic of biopsy In this country the Vim Silverman design of needle has become most popular but the Iversen Roholm and Gillman and Gillman types are entirely satisfactory The specimen is taken with the patient in the supine position following local procaine infiltration of the selected site from skin down through the liver capsule There is no best spot to choose for biopsy If the liver is not enlarged an intercostal approach must be used The anterior or midaxillary line over the middle of the area of liver dullness in midinspiration is a good site This usually means the eighth or ninth interspace When the liver is enlarged the subcostal approach in the nipple line is satisfactory If a tumor can be palpated on the liver s surface or if the left lobe is particularly enlarged the needle may be inserted directly into the area in question During the biopsy thrust itself which requires only two or three seconds the patient holds his breath—in deep inspiration if the subcostal approach is used and often in midinspiration for the intercostal approach The actual technic and the manipulations of the needle must be learned from personal instruction and the first several biopsy efforts should be carried out under the guidance of an experienced teacher

Needle biopsy of the liver is a potentially dangerous technic and several important precautions must be observed It is not an out patient procedure and a minimum of 24 hours complete bed rest is required after the biopsy The patient s medical problem physical findings and emotional make up must be well known to the operator The only absolute contraindication is the patient s refusal or inability to submit to the procedure There are several relative contraindications including the probability that microscopic examination

of liver tissue will not help significantly in the patient s future management The presence of ascites is not a contraindication but be cause one would like to be able to depend on a tamponade effect by the chest wall it is best if circumstances permit to drain the fluid off before biopsy is done Significant prolongation of bleeding clotting or pro thrombin time is a warning to be given serious consideration Certainly the indications must be unusually urgent to justify biopsy when the prothrombin time is delayed beyond 30 per cent of normal

The mortality rate of Vim Silverman needle biopsy is about 0 2 per cent The important complication rate is about 0 6 per cent If the patient is kept at bed rest for 24 hours if the vital signs and general condition are checked every half hour for four hours and hourly thereafter and if at least 500 ml of cross matched whole blood are kept in readi ness one has taken the necessary postbiopsy prophylactic precautions Hemorrhage from the liver is the common problem Some bleed ing always occurs but serious hemorrhage is actually rare It is least common in cases of portal cirrhosis Chest wall tamponade is a very important protective device The first time one takes a needle biopsy at laparotomy or under peritoneoscopic control he will be shocked to find how much blood quickly issues from the tiny hole in the liver Bleed ing is important only in relation to the total amount lost however and small amounts of free blood are quickly absorbed Bile periton tis a serious complication has been discussed in a previous chapter Traumatic pneumo thorax and hemothorax are rarer sequels which may occur if the site for inserting the needle is too high They can be blamed on poor technic while hemoperitoneum and bile peritonitis are calculated risks

JAUNDICE

The normal circulation and excretion of bile depend on some rather complicated bio chemical processes in scattered areas of the body Bilirubin is derived from hemoglobin The first step in the process takes place in the cells of the reticuloendothelial system where erythrocytes are destroyed in the nor mal course of physiologic events Here the iron is removed from the released hemoglobin and the residual pigment bilirubinglobin is returned to the circulation This is picked up by the liver cells bilirubin is separated upon breakdown of the bilirubinglobin and the bilirubin is excreted as sodium bilirubi nate into the bile by the liver cells

In the colon most of the bilirubin is reduced by bacterial activity to urobilinogen (meso bilirubinogen plus stercobilinogen) Uro bilinogen is capable of being oxidized quickly to urobilin A portion of urobilinogen is normally absorbed from the bowel by the portal circulation and returned to the liver Part is then reconverted by the liver cells to sodium bilirubinate and returned to the bile Some of the urobilinogen which is returned to the liver passes right on through into the systemic circulation and is then excreted by the kidneys The normal adult loses approxi mately 150 to 300 mg of urobilinogen in the stool daily Normally he excretes less than 4 mg daily in the urine

There are many useful and intelligible ways to classify jaundice One is as follows

I Hepatocellular insufficiency
  A Acute
  B Chronic
II Obstructive jaundice
  A Intrahepatic
  B Extrahepatic
III Hemolytic jaundice
IV Congenital hyperbilirubinemias

The general mechanisms involved in the different types are not difficult to visualize although excessive simplification must neces sarily introduce inaccuracies through omis sion When liver cells become injured they simply become unable to excrete the bilirubin which is normally formed When there is obstruction to the outflow of bile it is re sorbed into the general circulation after it has passed through the liver cells Abnormally active hemolysis results in excessive produc tion of bilirubin and this may so overtax the excretory powers of the liver that hyper

(sometimes the icteric index must be used as a substitute)

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C *Bromsulfalein retention*

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sive one and the mortality rate is very high although in the early stages it is potentially reversible Survival is rarely encountered in liver failure which is secondary to viral hepatitis or to hepatoma

ETIOLOGY

Of more importance than the basic disease because of better prophylactic possibilities are the factors which can tip the balance from compensation to decompensation Acute alcoholic episodes and sudden blood loss from any part of the body are the common explanations for liver failure in the cirrhotic Even a small hemorrhage—usually of variceal origin—which is quickly brought under control may be sufficient to initiate coma In addition to the hepatocellular injury produced by the blood loss itself the presence of large amounts of blood in the gastrointestinal tract creates an important strain on nitrogen and ammonia metabolism The intestinal contents of the bleeder are a potent source of ammonia The urea splitting organisms of the intestine by themselves are capable of producing high ammonia concentrations in the portal blood under certain circumstances Injudicious prescription of certain common drugs can sometimes be incriminated All opiates and particularly morphine are very dangerous when liver disease is present If the patient with cirrhosis develops coma after a dose of morphine the chances are good that he will die This is an especially important point because the cirrhotic patient often seeks help because of hematemesis and it is a habit in some quarters to use morphine routinely for gastrointestinal hemorrhage The barbiturates appear to be moderately dangerous in this connection The pharmacologic difference in relative hepatic toxicity between the different barbiturate compounds does not seem as striking in clinical practice as it does in the laboratory none can comfortably be considered entirely safe Ammonia containing compounds are capable of precipitating coma in patients with severe liver disease Ammonium chloride most often is responsible because of the common use of this drug in combatting the edema and ascites of cirrhosis Acetozoleamine (Diamox) another diuretic seems to be just as dangerous Here the action is different for as a carbonic anhydrase inhibitor it interferes with conversion of ammonia to the ionic form There is no question that excess protein intake can be dangerous for the patient with serious diffuse liver disease It is a clinical observation that some cirrhotic patients who are on the verge of metabolic decompensation are pushed over into coma when their daily protein intake is merely increased from 50 to 100 gm The patient who has had a portacaval shunt seems particularly susceptible to the bad effects of excess protein intake This is the meat intoxication of older clinical parlance It creates another problem in strained nitrogen and ammonia metabolism Liver failure sometimes quickly follows abdominal paracentesis in cirrhotic patients for reasons which are not clear It may be that the low sodium syndrome encouraged by paracentesis can by itself be considered a forerunner of hepatic coma when severe liver disease is present Finally any period of general physical stress may prove a sufficient incitant for hepatic failure Surgical operations are notoriously dangerous Most of the cirrhotics who do not survive portacaval shunt succumb to liver failure during the first two postoperative weeks Acute infectious processes of most any type may be responsible for decompensation

In hepatic coma the blood usually shows these abnormalities metabolic acidosis depressed potassium depressed magnesium increased ammonia increased pyruvic acid increased ketoglutaric acid and increased free amino acids especially cystine methionine and glutamic acid The serum iron becomes very high because normally the liver s polygonal cells pick up about 80 per cent of the iron which is removed from the serum but they lose the ability as they fail The urinary output of amino acids is greatly increased Many other abnormalities could no doubt be found with better measuring technics Which ones are responsible for the coma of liver

bilirubinemia results In all probability some factor such as simple fever must depress hepatic function before hemolysis however active can cause jaundice in view of the normal efficiency of the liver in handling the pigment The congenital hyperbilirubinemias must for the moment be classed by themselves as a heterogeneous group probably with some complex pigment abnormalities at work

The bilirubin which normally circulates in the blood appears to play no part in the production of normal skin color The color alteration in jaundice is due primarily to bilirubin but it varies towards orange or green according to the proportion of biliverdin which is taking part The exact shade of the *skin is not particularly helpful for judging* the type or cause of jaundice If there is anemia the color may be a very delicate yellow As the bilirubin level rises the tissues of the body become progressively stained but the skin lags a day or two behind the rising blood level in taking up the pigment The same is true for the skin s giving up of its jaundice as the bilirubin level falls so that changes in the intensity of skin color permit only a late estimation of variations in hyperbilirubinemia The quality of the examining room s illumination plays a big part in clinical detection and evaluation of jaundice even outspoken jaundice may be overlooked if the light is poor Bright daylight is best Surface tissues which are richest in elastic tissue such as the sclerae and ventrum of the tongue become stained first The skin over edematous areas either does not take up the stain or becomes only slightly discolored Patches of vitiligo usually escape too Urticarial areas on the other hand become more intensely icteric than the surrounding skin In infants *and children* teeth which are formed during prolonged jaundice may become permanently stained green Xanthopsia or yellow vision may occasionally occur when jaundice is severe

The several causes for skin yellowness other than jaundice can usually be detected as such from the history and examination although the chemical nature of the pigment may be difficult to identify If yellow skin color is not due to disease it is usually due either to drug pigmentation or industrial staining Drug induced jaundice is occasionally employed for purposes of malingering Carotinemia on the other hand is a natural process which depends merely on excess carotene intake with the food The pigment becomes concentrated in the thicker and more sebaceous parts of the skin and never stains the sclerae or mucous membranes Aurantiasis is a *similar type of temporary pigmentation* secondary to excess consumption of oranges Atabrine is the main pharmaceutic explanation for yellow skin An intense color may be built up within a short time Although *the mucous membranes may take up a little* of the stain the sclerae never do Fluorescence of the fingernails under Wood s light comes close to proving Atabrine as the cause when the problem of yellow skin in the absence of scleral icterus presents itself Several industrial pigments may stain the skin and sometimes the hair either locally by surface contact or generally by systemic absorption Picric acid is the most common offender Some of the systemic diseases particularly pernicious anemia uremia and myxedema may be accompanied by more yellowness of the skin than can be accounted for by the level of the serum bilirubin

LIVER FAILURE

The greatest threat to the patient with diffuse liver disease acute or chronic is simply failure of the organ to carry out the metabolic functions necessary for life The tremendous physiologic reserve of the liver can play a heroic part when only portions are damaged or destroyed but when liver disease is diffuse the reserve may not be given a chance to help The most common causes of liver failure the main clinical manifestation of which is hepatic coma are portal cirrhosis chemical poisoning and acute viral hepatitis but most any primary or secondary liver disease may be responsible including mere tumor infiltration The condition is a progres

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impending coma being the first evidence of motor disturbance in most cases Correlation between it and elevation of the ammonia level is rather close The flap is elicited by having the patient hold his arms out in front of him whereupon the hands and sometimes the whole arms show a series of quick dipping motions with quick recovery The phenomenon can also be brought out by exerting tension against the patient s contracted extensor muscles It shows that there is inability to sustain steady muscle contraction in the absence of any element of rapid muscle fatiguing The movements disappear on repose There is also exaggeration of the tendon reflexes and there may be ankle clonus

Electroencephalographic abnormalities are usually demonstrable during coma although they are not specific for this condition There is slowing and disorganization of the alpha rhythm with superimposed bilaterally synchronous high voltage slow waves in the delta range For reasons which are not easily explained electroencephalographic abnormalities may persist for months after a patient has recovered from hepatic coma and has returned to a life of compensated liver disease The only other neurologic laboratory abnormality is found in the spinal fluid which shows increased protein bilirubin and glutamate

Fetor hepaticus is a specific sign of liver failure The odor can be learned only in the sickroom It is said to be mousy but because not too many people remember how a mouse smells this is not very helpful information It is likely that the fetor is due to a volatile methyl mercaptan which is produced as a result of faulty methionine metabolism Possibly in addition a complex compound of the piperidine group contributes to the odor When fetor hepaticus is present the urine also has a similar odor and such urine contains a high concentration of α methylpiperidine

As has already been emphasized hepatic coma is a lethal process The clinician needs no special signs to warn him of an unfavorable prognosis There are a few however which he particularly fears Demonstration of a rapidly shrinking liver is a particularly poor prognostic sign indicating diffuse hepatic necrosis Because the liver may not have been enlarged to begin with it is necessary to follow liver size at frequent intervals by percussion Progressive jaundice almost always accompanies coma and the rapidity of its change gives prognostic information Early in coma it should be noted the serum bilirubin may be only slightly elevated so one must not necessarily expect jaundice even though it will be present in most cases Liver failure is the only clinical situation in which the level of the blood urea nitrogen becomes widely dissociated from that of the nonprotein nitrogen A fall in the former with a rise in the latter is a bad prognostic sign

TREATMENT

It can be seen from the listing of factors which may aggravate liver incompetence to the point of inducing failure that there are many opportunities for prophylaxis These involve control of alcohol hemorrhage excess protein intake ammonium drugs acetozoleamine opiates barbiturates low sodium syndrome and surgical procedures All are very important Most require no special comment except that the contraindication in the case of certain operations is of course only a relative one

Many types of therapeutic effort are indicated when incipient or overt hepatic coma is recognized They amount to indirect efforts to control the patient s metabolism in such a way that the liver s job will be made easier Ordinarily part of the problem is salt retention and because the liver requires sugar and cannot handle nitrogen well the diet for patients who can eat should be low in both salt and protein Support of carbohydrate metabolism with intravenous glucose is important Routine supplementation with vitamin K oxide is recommended with the realization that it is not a good answer to the complex hemostatic problem created by a failing liver To control manic excitement the safest and most effective help is unquestion

failure it is not possible to say Chemically no difference can be found between decompensated patients who are in and those who are out of coma There is however special interest in failure of ammonia metabolism during coma this being an aspect of the etiology which seems especially important to the clinician as well as to the biochemist

Ammonia is only one of many compounds which increase in the blood during hepatic coma A while ago there was not a great deal of reason for special focus on ammonia to the partial neglect of other factors but as study has continued it appears that ammonia intoxication may be one of the fundamental problems in coma Often the degree of failure —not the depth of coma—parallels the level of blood ammonia Although the level in the peripheral venous blood is occasionally found to be elevated in the absence of coma it is believed that the level in hepatic vein blood increases only when there is severe liver damage The correlation between the peripheral blood ammonia level and the neurologic state is especially striking in patients who have had a portacaval shunt much less so in those with simple hepatic failure

During normal metabolism ammonia is produced largely in the kidneys and by bacterial action on amino acids and urea within the gastrointestinal tract Renal ammonia is derived from glutamine Ammonia is also believed to be formed during intracellular metabolism especially in the nervous tissue It is utilized during the process of amination in the liver and this organ has a high reserve for ammonia clearance The normal level in the portal vein averages about 250 μg of ammonia nitrogen per 100 ml when measured by the Conway technic When blood emerges from the liver in the hepatic veins its level is found to have fallen to about 80 μg The normal peripheral venous value averages about 50 μg which is half that of the renal vein The basic metabolic problem created by increased circulating ammonia appears to be interference with completion of the Krebs cycle through combination with α ketoglutarate

Renal hepatic interrelationships are extremely complex in acute liver disease Sometimes abnormalities of one organ seem to damage the other and sometimes there seems to be a common noxious influence The concept of a concrete hepatorenal syndrome in certain situations which lead to hepatic coma however has probably been overemphasized and its validity is being challenged from many quarters Elucidation of the pathophysiology involved raises a succession of very difficult problems not yet solved For the moment it appears that there are no biochemical secrets or solid concepts which would permit the clinician to do any better than simply to adjust treatment so that it will include both a failing liver and failing kidneys

CLINICAL ASPECTS

The clinical picture of liver coma is largely a neurologic one Pathologically cerebral perivascular demyelinization develops being compatible with the simple nonspecific change which develops in response to any endogenous toxicity The early signs are drowsiness lethargy and confusion and it cannot be emphasized too strongly that the clinician must constantly be on the alert for these important signs of incipient coma among his liver patients Furthermore it is especially important to note that these signs like all the manifestations of hepatic coma, come and go sometimes quickly and sometimes for days at a time The cerebral disturbance is diffuse and the early manifestations are often vague If the examiner has not known the patient previously they may be difficult to recognize and interpret Unfortunately acute psychosis may be the first impression and emergency commitment to a mental hospital the disposition At times especially in the coma of acute viral hepatitis the picture of extreme delirious excitement or wildly manic behavior follows drowsiness quickly The patient may cause serious physical injury to himself or attendants Terminally central hyperthermia frequently develops

The flapping tremor is a helpful sign of

narrow stalk of liver tissue Occasionally the lobes are actually ectopic lying within the pleural cavity and connecting with the liver by a thin vascular pedicle

Diagnostic confusion arises when an accessory lobe is discovered during abdominal palpation or roentgen examination In the former instance it is a subhepatic lobe which creates the problem Riedel s lobe feels like a firm mass which is either obviously attached to the liver or apparently quite mobile within the peritoneal cavity The criterion of movement on respiratory activity is of unreliable assistance if the lobe is on a thin stalk Roentgenographic problems are created when an accessory lobe is located so as to deform the diaphragmatic profile Diagnostic pneumoperitoneum may be of help in such cases Often enough the true nature of such a mass which is discovered in a patient who has symptoms pointing to the region can safely be determined only by surgical exploration or percutaneous biopsy

It is very rare for an accessory lobe to be responsible for sickness Acute torsion is the usual mechanism Acute torsion of Riedel s lobe produces a clinical picture much like that of acute cholecystitis Subhepatic accessory lobes tend to become adherent to near by structures and thereby may cause deformity of the stomach and duodenum as they are studied during fluoroscopy

NEONATAL JAUNDICE AND INFANTILE CIRRHOSIS

During the neonatal period jaundice may be entirely benign and physiologic In such cases the excess bilirubin is almost entirely the slowly reacting fraction explained in part by physiologic postnatal hemolysis There is much more to it than hemolysis however because erythrocyte counts on cord blood are not much higher than those of the young baby and because the bilirubin content of cord blood and that of the meconium are in inverse relationship It is likely that simple inefficiency of hepatic excretion of bilirubin in the fresh neonate is part of the explanation Jaundice is never evident at the time of birth and in only about a quarter of the cases does it appear before 24 hours have passed Slight degrees of jaundice are however of greater clinical significance in infants and children than in adults because the level of serum bilirubin must be higher—up to 4 to 8 mg —before scleral and cutaneous icterus becomes detectable It is not clear why the icterus threshold is so high in very young people The great many diseases which cause pathologic neonatal jaundice may be classified as biliary tract obstruction diffuse hepatic disease general sepsis and hemolytic disease

About half of cases of neonatal obstructive jaundice are due to congenital atresia of the biliary tract and this may be intrahepatic or extrahepatic Few of the babies can be helped by surgical or other means Biliary cirrhosis is found at autopsy The other common cause of obstruction is inspissation of bile This often complicates simple distal atresias and less frequently is a complication of neonatal hemolytic diseases and of infant viral hepatitis In congenital myxedema there may be a type of neonatal jaundice which lasts six weeks or longer and for this reason thought must be given to the possibility of myxedema whenever jaundice of the newborn is encountered A portion of neonates who develop general sepsis of any origin show jaundice within a few days The explanation probably includes both hemolysis and hepatic injury Primary liver tumors and cytomegallic inclusion disease are very rare explanations for jaundice in the newborn

The neonatal hemolytic diseases comprise a very complicated group the most important being erythroblastosis These diseases may be complicated by kernicterus Common manifestations in addition to jaundice are hepatomegaly splenomegaly mucosal hemorrhages and pulmonary hemorrhage Dental sequels of jaundice during the periods of dentine formation and enameloblastic activity are green baby teeth and hypoplasia of the enamel

Important diffuse liver disease of the new

ably furnished by intramuscular paraldehyde Throughout treatment it is important to recall that this class of patients is particularly vulnerable to acute pulmonary edema secondary to additions to an overloaded circulation There is a special hazard too from hypostatic and aspiration pneumonia

A good part of the problem concerns electrolytic control Unfortunately direct *dialysis with the artificial kidney* has nothing to offer in management of the imbalances Potassium deficit must be controlled with care If low sodium syndrome should be present this deficit must also be managed as one of the first therapeutic considerations It is difficult sometimes to maintain alertness towards the possibility of low sodium troubles in diseases which are ordinarily characterized by sodium retention The clinical picture as it may develop during therapy which includes salt restriction simulates adrenal cortical insufficiency with apathy anorexia nausea cramps and hypotension Depletion of the salt content of the extracellular fluid leads to decreased glomerular flow and the result is both water and nitrogen retention Low salt diets are not always innocuous for the patient with liver disease and diuretics and paracenteses add greatly to the problem if the low salt syndrome develops during treatment of liver failure Supplementation with intravenous hypertonic saline solution will produce rapid and dramatic results

There are a few active measures in addition to the prophylactic steps that have been mentioned which can help combat ammonia intoxication After gastrointestinal hemorrhage has been controlled it is well to rid the colon of its free blood by enemas Intestinal flora should be suppressed and Aureomycin seems ideal for this Intravenous Aureomycin in doses of 2 gm daily has an important beneficial effect in both prophylaxis and treatment of liver failure and part of its usefulness may be due to suppression of bowel bacteria

The effectiveness of glutamic acid supplementation is a controversial matter Initial evaluation seems to indicate that it is helpful The spontaneous fluctuations into and out of coma make it very difficult to decide how much Glutamic acid which is an amino acid related to aspartic acid can be administered whether the patient is conscious or in coma If he is able to take it by mouth or stomach tube 40 gm of the material as glutamic acid are given daily It is not soluble enough to be administered intravenously however and for this either monosodium glutamate or a mixture of sodium and potassium glutamate must be used The daily dose is about 24 gm It is a very acid solution Unfortunately 24 gm of monosodium glutamate contains about 4 gm of sodium a limiting factor for many patients with chronic liver disease

The adrenal steroids and corticotropin have little to offer the patient who is in liver coma Occasionally help is reported but in general it is best not to use them They create problems in water and sodium retention potassium diuresis and nitrogen balance and may encourage bleeding from varices or other parts of the upper gastrointestinal tract

CONGENITAL DISEASES

ACCESSORY LOBES

Anomalous accessory lobes are important for three reasons they may cause diagnostic confusion they may interfere with surgical *manipulations by obscuring the* operative field and rarely they may undergo torsion The most common lobar deformity is Riedel s lobe a flat process which extends inferiorly from the anterior edge of the right lobe overlying or just to the right of the gall bladder The next most common is a rounded accessory lobe which develops on the superior profile or posterior surface of the right lobe Much rarer are accessory lobes attached to other portions Most of these tissue masses are rather small but occasionally they measure up to 20 cm in diameter Most are attached to the liver as rather sessile structures Sometimes the connecting tissue bridge takes the form of a short mesentery or a

is histologically normal except for the presence of a great amount of unidentified intracellular granular brown pigment concentrated largely in the central portion of the lobules In addition to hyperbilirubinemia the values for bromsulfalein retention thymol turbidity and cephalin cholesterol flocculation are elevated There is no treatment

PRIMARY HEMOCHROMATOSIS

The Kleckner classification of the abnormal iron storage states is especially useful because it is simple and because it is based on their clinical aspects

I Hemochromatosis
   A Primary (classic type)
   B Hereditofamilial
   C Type associated with chronic anemia
II Hemosiderosis
   A Type associated with malnutrition
   B Type resulting from multiple blood transfusions
   C Type following iron therapy
   D Type associated with megaloblastic hemolytic or refractory anemia

Primary or classic hemochromatosis is a congenital metabolic disease characterized by extensive deposition of iron throughout the body and diabetes mellitus cirrhosis and skin pigmentation The primary fault appears to be increased iron absorption due to some unexplained breakdown of the gastrointestinal mucosal block which is depended on to keep iron out unless it is needed The excess iron immediately leaves the circulation to be stored in various organs—liver spleen salivary glands pancreas heart the reticuloendothelial system all of the endocrine glands portal lymph nodes and gastric mucosa It becomes trapped because the body has no natural mechanism for active excretion of iron The tissues accumulate from 20 to 60 gm of iron compared to the normal of 3 5 to 4 0 gm There is however much more to the metabolic and pathologic disturbances of hemochromatosis than mere local deposition of iron for in simple hemosiderosis when the amount of excess is as great there is no cirrhosis or diabetes Hemosiderosis is a pathologic process not a clinical disease as is hemochromatosis In the latter there is fatty infiltration necrosis and fibrosis of the pancreas with destruction of both acinar and islet tissue The liver becomes very large with the changes characteristic of portal cirrhosis

It is usually found that the cirrhosis of hemochromatosis as judged by the clinical features and liver function tests is relatively benign as compared with other types of cirrhosis that have a comparable degree of fibrosis It shows a remarkable ability to withstand therapeutic phlebotomy in marked contrast to the usual intolerance of the cirrhotic patient to sudden blood loss Histopathologically there is hepatocellular necrosis compensatory lobular regeneration heavy fibrosis and hemosiderosis of liver cells stroma bile duct epithelium and Kupffer cells There is a distinct tendency for hepatoma development

The clinical picture of primary or classic hemochromatosis is marked by the manifestations of both cirrhosis and diabetes as they are encountered as separate entities Early diagnosis depends on alertness for skin pigmentation especially of the forearms and for unexplained weakness and hepatomegaly The latter may be of extreme degree Although the disease probably begins early in life before puberty the manifestations usually do not appear until midadult life The diagnosis can rarely be considered in patients younger than 20 years It is primarily a disease of men Although the iron content of the skin is increased the typical slaty pigmentation is due to excessive amounts of melanin in the basal layers seen through an atrophic epidermis and not to hemosiderin There is often hypogonadism with impotence and decrease in the amount of body hair The spleen is ordinarily enlarged The cause of death usually is either liver failure variceal hemorrhage ventricular standstill or other major arrhythmia heart failure or a diabetic complication

Diagnosis is largely a clinical matter but considerable laboratory information is use

born which is not secondary to biliary obstruction is usually due either to congenital syphilis or to viral hepatitis No neurologic manifestations develop in these diseases Viral hepatitis of the newborn is a recently recognized entity The virus involved has not been identified with assurance and perhaps several types will eventually be implicated Liver damage is regularly severe and when there is survival convalescence is accompanied by the development of important fibrous residuals In the rare disorder of galactosemia secondary to congenital inability to metabolize galactose the clinical and laboratory features are those of combined portal and biliary obstruction and following death from undernutrition autopsy reveals biliary cirrhosis

Infantile cirrhosis once known as a disease entity is now best thought of as a variable group of chronic residual processes secondary either to acute neonatal disease or to nutritional deficiency *Infantile cirrhosis* of the portal type it appears can always be blamed on a nutritional fault Postnecrotic cirrhosis is also encountered occasionally in infants and if there is a history of neonatal jaundice it can be assumed that this represented some form of acute hepatic necrosis such as that caused by viral hepatitis In certain regions particularly India central and South Africa and the West Indies cirrhosis is reported as common among infants and children and throughout the world it is apparent that diffuse hepatic fibrosis of young people is correlated closely with poverty and presumably undernutrition Fatty infiltration is the first of the histopathologic changes in these babies and even if the fat should disappear as a result of treatment or spontaneously during maturation eventual development of portal cirrhosis seems inexorable in many cases Ascites and hemostatic problems are common clinical features and the prognosis is very poor

Kwashiorkor not sufficiently popularized in view of the problem it creates in some parts of the world is a protein deficiency disease of the tropics and subtropics with *predominant hepatic damage* Malaria may be of additional etiologic significance With onset at weaning the clinical manifestations include unsatisfactory growth edema faulty pigmentation and a peculiar red discoloration of the hair The liver is enlarged often greatly so and the histopathologic picture is that of portal cirrhosis

THE CONSTITUTIONAL HEPATIC DYSFUNCTION DISEASES

These are a group of rare and poorly understood conditions which are of great theoretic interest and of increasing curiosity on the part of the clinician It is a group which is continuously being subdivided and the subdivisions are continuously being redefined

Constitutional or hereditary hyperbilirubinemia now generally known as Gilbert s disease is first discovered when the patient is young The single abnormal finding characteristic of the disease is impaired excretion of bilirubin by the liver cells It is therefore a benign metabolic defect There are fluctuating jaundice for years fatigue little discomfort in the liver region simple dyspepsia normal color urine little or no hepatomegaly and a strong family incidence without sex preference Cholecystography gives normal results Histologically the liver is normal Except perhaps for fatigue there is no subjective illness Unfortunately the chronic jaundice may lead to endless clinical studies and these themselves may be an important source of disability No treatment is indicated other than protection of the patient from further investigation once the diagnosis has been established

The variety of *nonhemolytic hyperbilirubinemia* which is now known as Dubin Johnson disease is also characterized by fluctuating jaundice which may persist for many years in patients who in other respects seem rather healthy Jaundice usually first begins between the ages of 12 and 15 years There is no obstructive element but for some reason the gallbladder can never be opacified by cholecystography The liver is enlarged It

of iron In view of the cirrhosis problem it is well to reinject the plasma removed This is a slow but effective way to eradicate iron and treatment may have to be continued at regular intervals indefinitely The patient s blood picture is followed closely however and treatment is interrupted if more than moderate anemia develops The use of chelating agents has been disappointing in the treatment of hemochromatosis

WILSON S DISEASE (HEPATOLENTICULAR DEGENERATION)

This is a group of related hereditary metabolic conditions due to a recessive gene characterized by faulty copper and amino acid metabolism and manifested mainly by progressive central nervous system and hepatic abnormalities How many actual entities are involved is difficult to say Differences from one affected family to another are mainly chemical ones the clinical picture being rather similar in all There is a high consanguinity rate in families which manifest Wilson s disease Because the gene frequency is about one per thousand and the gene is recessive only about one of a million random matings is likely to result in affected children

Wilson s disease ordinarily becomes apparent through neurologic symptoms when the individual who develops normally reaches the last half of the second decade There are two general courses the acute febrile form which begins during adolescence and kills within four years and the pseudosclerotic form which comes to light a few years later and runs a more chronic although eventually fatal course Neurologic abnormalities of extrapyramidal origin usually dominate the clinical picture at the outset These are quite different from the encephalopathy which may be secondary to decompensated liver disease Because the cerebral lesion involves the basal ganglion system with degeneration and atrophy particularly of the putamen the manifestations simulate those of parkinsonism The other major differential neurologic diagnosis is multiple sclerosis Frequently there are irritability childishness slurred speech isolated palsies poor coordination and coarse intention tremor Later extremity spasticity rigidity clonus dysphagia contractures muscle wasting severe emotional disturbances and mental deterioration are common

The liver disease is cirrhosis of differing rapidities of progression and eventually its clinical manifestations and histopathology do not differ from classical portal cirrhosis In about one third of the cases clinical hepatic disease becomes evident before neurologic disease Occasionally liver enlargement has been noted since childhood Ascites edema and spider angiomas may be early findings

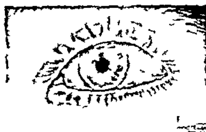


FIG 175 Kayser Fleischer ring

Rarely the liver quickly undergoes decompensation and the patient dies Usually hepatomegaly merely progresses slowly and splenomegaly and chronic mild jaundice appear after a variable period Function tests show the liver abnormalities expected in cirrhosis Hemorrhage from esophageal varices secondary to portal hypertension often becomes the main clinical problem as the disease progresses Death is usually due to liver failure often initiated by variceal hemorrhage or to intercurrent infection

The finding of Kayser Fleischer rings is one of the important ways for the clinician to confirm the diagnosis (Fig 175) These are thin green brown rings around both of the corneal limbi in the area which is more familiarly occupied by arcus senilis Kayser Fleischer rings represent areas in which highly refractile copper crystals have been deposited in either the endothelium or

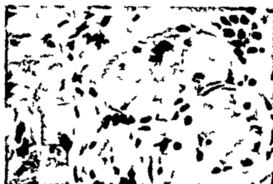


Fig 173 Primary hemochromatosis Vacuum tube gastric biopsy specimen

ful both for evaluation of the seriousness of the liver pancreatic and heart disease and for certain features which are specific for hemochromatosis As far as the latter are concerned one should note that although the circulating iron level is high in hemochromatosis it is also elevated in cirrhosis which is not accompanied by metabolic iron disease If the plasma iron level is to be considered confirmatory for the diagnosis of hemochromatosis it must be very high indeed The Fishback skin test is not reliable enough to be useful for confirming the clinical impression Tissue is desirable for histopathologic study of the iron pigment and the easiest and safest way to obtain a suitable specimen is to biopsy the gastric mucosa with the vacuum tube gastric biopsy instrument (Fig 173) Because it is important also to evaluate hepatic damage needle biopsy of the liver may be preferred (Fig 174) Examination of sternal bone marrow is also useful for morphologic study of the iron pigment Because of the iron content of the liver the organ takes on a slightly radiopaque quality and occasionally the diagnosis is suggested quite unexpectedly by a routine film of the abdomen

Treatment is directed at the cirrhosis and diabetes with care for esophageal varices and drainage of iron from the body Although the diabetes may remain relatively mild and easily controlled for years it tends eventually to become resistant to insulin It has been observed that the hemochromatotic patient is a relatively poor risk for surgical portal decompression Repeated phlebotomy is in order and these patients tolerate removal of 1000 ml of blood weekly for years The aim is to remove as much blood as possible but to keep the hemoglobin level up to about 10 gm Each 1000 ml of blood removed means the loss of 0 5 gm



Fig 174 Primary hemochromatosis Liver biopsy specimen

problem at delivery may be very difficult Some reported fetal solitary liver cysts have been huge They may become very large in the adult, too sometimes filling the abdomen and pelvis and simulating some of the manifestations of ascites These large lesions frequently become pedunculated or they may merely replace and enlarge a whole liver lobe Weight and size of the cyst are the main problems for the patient Almost always the cyst walls are under low tension and displacement or compression of other organs does not seem to be a problem

Pathologically the cysts usually are found to have a thin wall with a prominent venous network The single epithelial layer which lines the fibrous sac is usually intact and composed of cuboidal cells The fluid has been reported to have a specific gravity which varies from 1 005 to 1 024 Usually clear it may be stained yellow or brown Microscopically it contains fat droplets chemical crystals and a few cells

The indications for surgical therapy are relative ones depending not only on the degree of disability produced but also on the technical difficulties envisioned after exploration has permitted anatomic understanding of the lesion and its relationships Simple aspiration is a very temporary measure Sclerosis of the cavity is unwise Both marsupialization and creation of a cystoenterostomy create many more problems than they solve As a rule hepatic cysts should either be removed in entirety or left alone Sometimes a large solitary cyst can be extirpated easily although a natural cleavage plane does not exist about the lesion Pedunculated cysts are simply amputated Sometimes a partial hepatectomy must be done

POLYCYSTIC DISEASE OF THE LIVER

This is a very remarkable disease in many ways No other disease can produce such gross distortion of the liver with so little interference with its function and with the patient s health The disease is characterized by gradual development over many years of cysts throughout the liver substance There may be thousands seeming to replace the organ and some may grow to a diameter of 12 cm Ordinarily they are of assorted sizes many being submacroscopic The organ may become so large that it fills the abdomen and its external configuration may bear no similarity to that of the normal liver The individual lesions are thin fibrous sacs containing serous fluid which is under little tension Almost always the cysts are lined with a single intact layer of healthy cuboidal epithelium Rarely are the cells flattened

It seems well established that the development problem involved in polycystic liver disease is persistence of small aberrant bile ducts in groups throughout the liver parenchyma apart from the portal areas themselves These groups are known as Meyenburg s complexes The ducts which fail to involute appear to have no outlets and consequently they act as retention cysts They grow very slowly

The developmental fault is not confined to the liver The same type of process may go on in many other organs The commonest associated disease is polycystic kidneys which occurs in half the cases Almost as common are polycystic pancreas and cystic disease of the lungs Cystic processes may develop in the spleen brain ovary breast pituitary peritoneum pineal body and parathyroid glands Intracranial aneurysm occurs in about 5 per cent of cases

Subjective illness is produced by the size and weight of the organ and the discomfort and pressure sensations it may produce The disease is more common in women than men All races are equally affected Usually the patient is not aware of trouble until mid adult life first noticing an increasing girth and later a weight in the abdomen Often there is a history of occasional sudden severe upper abdominal pain with gradual clearing within a day or two One wonders if these episodes represent spontaneous rupture of a surface cyst The patient has no complaint about general health or other parts of the body unless the kidney pancreatic or pulmonary disease has caused a complication

Descemet's membrane They are apparently always present in the pseudosclerotic form of the disease and usually have enough time to develop in the acute form They may be difficult to demonstrate and may be much more apparent in one eye than the other Occasionally use of a slit lamp is helpful

Aminoaciduria comes close to being an essential characteristic of the disease although a few cases have been described in its absence It does not appear to be due to the liver disease however one must recall that aminoaciduria is not uncommon in primary severe parenchymal disease of the liver *The explanation in Wilson's disease* is probably failure of renal tubular resorption of amino acids due to damage by copper deposition Many of the amino acids are found in relatively high concentrations The highest are attained by threonine and cystine Proline and citrulline ordinarily foreign to the urine may appear

The fundamental and only constant metabolic abnormality appears to lie in the amount transport and distribution of body copper The normal plasma copper level ranges from about 70 to 160 μg per 100 ml and over 90 per cent of this is contained in a stable copper protein ceruloplasmin which electrophoretically is an A globulin The copper content of the urine normally ranges from nothing to 15 μg per 100 ml In Wilson's disease there is probably an excessive absorption of copper The serum ceruloplasmin is reduced fecal copper greatly reduced urinary copper greatly increased and diffusible copper content of the spinal fluid increased The copper content of the corneas kidneys liver and brain especially the basal ganglia becomes very high

Treatment by chelation with dimercaprol (BAL) offers temporary symptomatic help in a disease which is otherwise progressive Large doses of dimercaprol cause elimination of considerable amounts of copper through the urinary route Life cannot be prolonged however and the pathologic changes as observed at autopsy are not altered Following *remission induced* by a course of treat*ment relapse may* be severe A proper course of dimercaprol might consist of 400 mg intramuscularly every four hours the first day every 12 hours the next and then once daily for six days The course is repeated as the clinical situation dictates It is impracticable to reduce the copper content of the diet although small doses of potassium sulfide may safely decrease copper absorption

DEVELOPMENTAL CYSTS

Developmental cysts of the liver include the solitary retention type cyst and the lesions of polycystic disease They comprise *only a portion of the liver's cystic lesions and* in fact, as is the case with any solid organ almost all acquired localized abnormalities are capable of producing a cystic space within them simply through tissue destruction Pyogenic abscesses are *probably the* most common examples Parasitic cysts are usually due either to amebiasis or to echinococcosis Neoplastic cysts take the form of cystadenomas teratomas lymphangiomas and degenerative primary and metastatic solid tumors The clinical significances of these show wide variations governed almost entirely by the etiologic type All occur more frequently in the right lobe than the left

SOLITARY DEVELOPMENTAL CYSTS

These are retention type cysts which develop either within the liver substance or extrahepatically as pedunculated masses Simple and multilocular forms occur There is some question whether it is correct to draw any fundamental distinction between solitary cysts and polycystic disease

A solitary cyst makes its presence known almost always because of its size or because by accident it is encountered during investigation for some other problem It seems that rarely such a lesion may become infected or the pedunculated ones may undergo torsion Diagnosis is ordinarily made at the time of birth or during midadult life In the former instance the size of the cyst causes fetal dystocia and the mechanical

gency surgical exploration is indicated The danger of death increases quickly with the *length of delay between injury and operation* Although in many cases there will be spontaneous healing if damage is not severe with no residuals or perhaps only formation of bile cysts this cannot be predicted The purposes are to stop bleeding and bile leakage clean as much bile as possible from the peritoneal cavity remove contused liver tissue and to make whatever repair is possible under the circumstances The traumatized liver is particularly susceptible to fulminating pyogenic infection and gas bacillus infection is a special threat

Approximately 20 per cent of penetrating abdominal wounds involve the liver and 2 per cent of these are complicated by penetration of the gallbladder or major biliary ducts It is difficult to discuss the mortality rate because of associated organ injury but for gunshot wounds it seems to be about 20 per cent at the present time *The external appearances of the wound and* the apparent course of the missile may be most misleading for judgment of whether the liver has been injured

LIVER DISEASE SECONDARY TO POISONING

Toxicopathic liver disease comprises a subject as large as toxicology itself The number of potential hepatotoxins in the civilized environment is legion Some are contacted accidentally through chance or carelessness in the form of industrial or household poisons some are prescribed medications and some are agents us d in criminal activities The form of damage common to most is hepatocellular necrosis Often this is confined to the central zone of the lobule but when severe it becomes diffuse throughout the organ Fibrosis may be a sequel The clinical picture is commonly compounded by toxic manifestations from other affected organs Hepatotoxins often poison the kidneys and hemopoietic system

Carbon tetrachloride is the most important of accidental hepatotoxins because of its potency and because of the frequent opportunity for contact which it presents Most cases are due to vapor inhalation under *conditions of poor ventilation during* use of the solvent for cleaning of machinery or fabrics Epidemic poisoning is common in these circumstances Even when one is aware of the danger he cannot depend on his senses to recognize a dangerous concentration Although the average nose can detect a hundred parts per million of carbon tetrachloride in air a toxic level the olfactory sense becomes dulled after brief contact Ingestion poisoning is less common but the damage is ordinarily more severe It has been found that when either fat or alcohol is ingested at the time of contact with carbon tetrachloride the likelihood of poisoning is increased Both obese and undernourished people seem particularly susceptible to the toxin and the presence of chronic alcoholism diabetes chronic nephritis or chronic cardiac disease renders the prognosis much less favorable But there is in addition great *individual variation in susceptibility*

The immediate effect of carbon tetrachloride on the patient is a degree of narcosis Dizziness nausea diarrhea vomiting headache *backache and great malaise develop* In inhalation cases it is unusual for vasomotor collapse respiratory arrest and ventricular fibrillation to develop as they often do when the material is ingested because the patient is likely to recognize the trouble he is in and to escape before he is this severely poisoned In the fulminating case however death may follow in 48 hours whatever the route of poisoning The main delayed effects are lower nephron nephrosis hepatic necrosis and hemorrhagic phenomena Acute renal insufficiency is often the main clinical problem but toxic hepatitis is at times the only important manifestation and hepatic failure the main worry The clinical picture is that of acute hepatocellular necrosis of any degree of severity In fulminating cases there may appear to be complete necrosis of almost all the liver cells (Fig 176)

By the time the patient comes to the doctor two physical findings are usually prominent The first is the posture and gait which are those of a healthy person with a large innocuous mass in the abdomen As the patient stands and walks there is a peculiar regal attitude caused by his leaning backwards to counterbalance the anterior *ballast* Even when the patient is looking straight ahead the illusion is that he is looking down his nose Second the abdomen is protuberant but no sagging appears at the flanks when the patient is supine There is no or very little ascites The superficial abdominal veins often form a prominent pattern Usually vague elevations of the abdominal wall can be detected at points at which some of the large surface cysts *press upward Individual cysts may be palpa* ble as soft areas on the liver surface There is no tenderness and no friction rub Sometimes the effect of back pressure is to be found in edema over the lower extremities Occasionally signs of other congenital defects are also present such as the murmurs of congenital heart disease or abnormalities of the external genitalia

In general all objective tests indicate that there has been little disturbance of general health or of liver efficiency The development and state of nutrition are normal The results of liver function tests are normal or almost so and when contemplating the usual autopsy specimen one must certainly wonder how this can be The most common abnormality is slight or moderate elevation of the serum bilirubin If liver biopsy is attempted when the diagnosis is not suspected cyst fluid is likely to be obtained instead of tissue This does no harm and may help to establish the diagnosis If liver parenchyma becomes available for examination it will be found to be normal unless by happenstance a Meyenburg complex has been included Esophagoscopic examination reveals varices in an unknown proportion of cases Although several *cases of cholelithiasis* have been reported cholecystography is expected to reveal normal structures

Next to the probability of eventual death *from renal failure if polycystic kidney dis* ease is present is portal hypertension and its effects There are no other special organic threats to life Probably most patients develop esophageal varices although there are no reliable data on this point Emotional problems created by the chronicity of the disease the cosmetic problem often produced and the realization that the process cannot get better are usually the most important com*plications to be dealt with Suicide* has been encountered on a few occasions

Treatment consists of tending to the patient s emotional problems and seeing to it that proper corsetting is obtained In almost all cases it proves to be a mistake to attempt direct treatment of the liver or its cysts *The disease is too benign and the liver* changes too extensive to risk a direct approach except in the most unusual circumstance Rarely partial hepatectomy may be attempted if the cysts are well localized but in such a case usually the disease needs no treatment Sclerosing the cysts is always a mistake

MECHANICAL AND CHEMICAL DISEASES

LIVER TRAUMA

Traumatic rupture of the liver from nonpenetrating wounds is not nearly *as common* as that of the spleen Clinical matters are discussed under the latter subject The main causes are crushing accidents direct assault as by kicking and falls from considerable heights Coasting accidents seem especially likely to result in liver injury Rib fractures *occur in about half of the cases* and about one quarter are complicated by rupture of the kidney or lung The mortality rate for nonpenetrating types of injury is now about 50 per cent partly accounted for of course by associated injury of other organs Development of more effective antimicrobial *drugs* and local *hemostatic* agents has done most to improve results of treatment If the diagnosis of rupture is suspected emer

gency surgical exploration is indicated The danger of death increases quickly with the length of delay between injury and operation Although in many cases there will be spontaneous healing if damage is not severe with no residuals or perhaps only formation of bile cysts this cannot be predicted The purposes are to stop bleeding and bile leakage clean as much bile as possible from the peritoneal cavity remove contused liver tissue and to make whatever repair is possible under the circumstances The traumatized liver is particularly susceptible to fulminating pyogenic infection and gas bacillus infection is a special threat

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LIVER DISEASE SECONDARY TO PRESCRIBED MEDICATIONS

A variety of commonly prescribed medications are able to produce liver damage In most cases individual idiosyncrasy seems to be responsible and the danger of poisoning must be accepted as a calculated risk In others therapeutic doses become dangerous to the liver only if there is liver disease to begin with Although many of the drugs which have proved to be most hepatotoxic have been discarded on this account others are too useful to permit their abandonment and hepatic injury must continue occasionally to pose as an unfortunate complication of pharmacotherapy

Chlorpromazine (Thorazine) became a remarkably popular drug very soon after its introduction because of its effectiveness in a variety of psychiatric and medical diseases Its only serious toxic effect is production of a form of hepatic disease characterized by central lobular biliary stagnation The true incidence of this complication is not known but it has been encountered in about 5 per cent of patients by most clinicians who have used the drug extensively Women seem more susceptible than men The clinical features are much like those of infectious hepatitis at the outset with rather rapid development of anorexia nausea vomiting diarrhea upper abdominal soreness pruritis and low grade fever Occasionally pruritis is the only symptom Jaundice follows in about two days The liver is ordinarily a little enlarged and moderately tender in both its lobes but in many cases there is no hepatomegaly A friction rub may be heard



FIG 176 Acute hepatic necrosis due to carbon tetrachloride poisoning Autopsy specimen

over the liver shortly after onset Splenomegaly is unusual There is leukocytosis and in about half the cases eosinophilia as high as 30 per cent develops during the first few days The eosinophilia disappears while the patient is still jaundiced Liver function tests suggest an obstructive type of jaundice with bile in the urine slight or absent urine urobilinogen elevated serum alkaline phosphatase and elevated cholesterol The flocculation tests prothrombin time and cholesterol esterification are normal Liver biopsy reveals bile stasis without bile lak ing no or very minor hepatocellular necrosis and a small amount of inflammatory in filtration It is apparent that the picture simulates extrahepatic obstructive jaundice closely and that there is danger of surgical exploration In most cases the process is spontaneously reversible without residual liver damage within two to four weeks At times a protracted course develops There is a fairly satisfactory means of prophylaxis if all patients who receive chlorpromazine are followed closely by periodic alkaline phos phatase determinations and the drug dis continued as soon as elevation is noted it is probable that serious liver damage can be avoided

Some other drugs may produce this same type of intrahepatic cholestasis with little hepatocellular damage and the clinical pic ture of obstructive jaundice Methimazole (Tapazole) thiouracil and methyl testosterone are prominent among these Use of methyl testosterone for the relief of the pruritus of jaundice is ill advised for this reason Some of these drugs induce a greater degree of inflammatory infiltration than others but the pattern of central lobular stagnation with out cellular necrosis is constant The re sults of the liver function tests are those of obstruction Eosinophilia however is rare except when chlorpromazine is the toxin Arsphenamine jaundice may occasionally be of this type but more often fulminating necrosis of the acute yellow atrophy variety is produced

Focal hepatocellular necrosis is a com plication of certain drugs of the anesthetic group Tetrachlorethylene and rarely the sulfonamides may cause the same type of damage In ferrous sulfate toxicity the acute injury is characteristically a hemorrhagic type of necrosis of the periportal lobular areas

VIRAL HEPATITIS

Although several systemic diseases of virus origin such as yellow fever may produce severe hepatic damage through popular usage the term viral hepatitis is understood to refer to common infectious hepatitis and to homologous serum hepatitis These two diseases are conveniently thought of together even though their etiologic agents and clini cal courses differ There is hardly need to point out the significance of viral hepatitis in this era in terms of its great world wide incidence its economic and social implica tions and its mere effect on the individual patient It is the most common cause of jaundice and it stands high among diseases contributing to manpower loss through prolonged disability During World War II approximately 182 000 cases occurred in the Armed Forces of the United States and our troops fared no better in this regard than did others Hepatitis has long been feared as a medical military problem but it has been an unexpected matter of concern to find that the end of the war did not bring the end of the hepatitis problem Both in military and civilian populations the hepatitis rates remain high

ETIOLOGY AND EPIDEMIOLOGY

The virus which causes infectious hepatitis is known as Virus IH or Virus A and that which causes homologous serum hepatitis Virus SH or Virus B The former which is closely related to and has approximately the same particle size as the latter is present in the blood small bowel contents and feces of patients with active hepatitis Following natural infection the virus may persist in the feces as long as a year and a half It may be transmitted through both oral and parenteral routes The incubation period is

then found to vary from 15 to 42 days Virus IH infection confers homologous immunity

Virus SH has been found only in the blood and it is known to be present during both the incubation *period and active stage of* homologous serum hepatitis It can be trans mitted only by the parenteral route The incubation period lasts from 40 to 160 days *It is probable that no firm homologous im* munity develops to Virus SH and no cross immunity between the two viruses has been demonstrated Multiple attacks are sometimes observed raising questions about multiple virus strains and variable immunologic capa bilities which cannot as yet be answered Both viruses are rather resistant to the usual physical and chemical agents which are used for decontaminating foods and natural medical products Unfortunately no experimental host or culture technic has yet been found for the viruses of viral hepatitis

Infectious hepatitis is a filth disease Its incidence in temperate climes tends to be highest in the fall People under 30 years of age are considerably more susceptible than older people although the illness is more serious in the latter group Little more can be said of either the endemic or epidemic behavior of infectious hepatitis than that contaminated food and water seem of first importance with the possibility that direct contact sometimes is also of consequence At times it behaves as a highly contagious dis ease The *carrier state* although known to exist is not well understood for its epidemi ologic potentialities Infectious hepatitis can be transmitted *by blood transfusion if the* blood is taken while the donor is in the in cubation period of the disease

To date experimental and clinical data *indicate that homologous serum hepatitis* can only be transmitted by the parenteral route either through injection of contami nated blood or blood products or by use of *contaminated instruments* It seems likely that 6 per cent of the population of this country and of Europe are blood carriers of the virus These people are asymptomatic but *if they can* be identified and studied it is *frequently found that their liver function* tests give abnormal results Extremely small amounts of their blood plasma may cause the disease upon injection into a susceptible per *son Pooled plasma is most dangerous for* transmission of course and the larger the pool the greater the danger But whole blood serum and plasma products im properly sterilized needles and multiple dose vials of injectables are all known to be im portant too

A striking feature of viral hepatitis is the wide variation in severity encountered among endemic cases and observed in mortal ity rates from epidemic to epidemic Quite clearly this has been governed in part by variations in virus virulence and in part by variations in patient resistance as exemplified by high mortality among institutionalized old and invalided people During World War II there was a mortality rate of 30 per cent for infectious hepatitis in some areas while in subsequent epidemics it has been as low as 0 2 per cent or there has been no mortality at all An epidemic prob lem which is more artificial than natural arises for homologous serum hepatitis only among recipients of pooled injectables self sustaining drug addicts *immunization station* patients and people exposed to similar forms of parenteral contamination Variability in mortality rates for this form of the disease is difficult to judge because *a large portion* of affected people already have other serious disease at the time they develop hepatitis The mortality rate in some series is re *ported to have been as high* as 10 and 20 per cent

CLINICAL PICTURE

The onset of infectious hepatitis usually differs a little from that of homologous serum hepatitis but thereafter the diseases behave much the same In general terms the former often has an influenza like onset and the latter begins insidiously But it is thought that this difference has been emphasized too much The whole course in addition to the onset may show wide variations from pa

tient to patient in both its symptomatic and objective manifestations The only truly prodromal symptom of viral hepatitis is among smokers a strange change in the smell and taste of tobacco smoke and sometimes development of actual abhorrence for smoking This begins about three days before the patient begins to feel sick

The specific complaints and manifestations at onset are the same in infectious hepatitis and homologous serum hepatitis but sometimes in the former it is as though they are compressed into a few days and consequently they seem more severe Anorexia quick fatigue malaise and upper abdominal discomfort are common first symptoms Often there is nausea and sometimes vomiting Some patients complain initially of headache sore throat pain behind the eyes muscle aching and joint pains and then chills and fever usually develop within a few hours Severe prostration often intervenes quickly when the onset is sudden In perhaps 15 per cent of all cases this pre icteric phase does not develop at all and then the patient first knows he is sick when he notices that his urine is very dark or when he is told his eyes are yellow

If there has been a symptomatic pre icteric phase the complaints characteristically become progressively severe until the time jaundice appears usually after about a week Both types of hepatitis sometimes manifest themselves as an anicteric illness Jaundice usually develops in patients who feel sick enough to seek medical help however although it may only be apparent in mild form for a day In an average case clinical jaundice lasts about three weeks Usually the appearance of jaundice marks the end of fever and the influenza like symptoms Anorexia nausea abdominal discomfort fatigue and malaise persist although there may be considerable improvement after a few days If hepatic coma supervenes it does so within a few days of the onset of jaundice

Dark urine and hypocholic stools are commonly observed through the period of increasing jaundice The patient loses about 15 lbs during the first two weeks of illness Common dyspeptic symptoms which are not caused by gastritis or any other anatomic disease of the stomach are likely to be the most important ones to the patient as the course continues A saddle back type of clinical course or symptomatic relapse following apparent recovery is observed in no more than 1 per cent of the patients

The early physical findings are those of an acutely but often only mildly ill person The abdomen may merely show mild resistance to palpation Whatever the actual objective findings the examiner is often most impressed by abnormalities found elsewhere than in the abdomen and prior to onset of jaundice the gastrointestinal complaints may be interpreted merely as part of the systemic toxicity which is expected in any acute infectious disease The findings in the throat may suggest a rather toxic form of acute pharyngitis Frequently enlargement of the posterior cervical lymph node chains is found and then the initial impression may be infectious mononucleosis

If jaundice has already developed the problem is much simplified At this stage the liver is almost always enlarged and tender Tenderness may be so marked that it interferes with satisfactory examination The liver edge is soft and descends about 3 cm below the costal margin upon deep inspiration Both hepatomegaly and tenderness may persist many weeks but ordinarily they clear in about two Splenomegaly can be detected in about 10 per cent of the patients

In some epidemics and in an occasional endemic case certain of the stigmas of portal cirrhosis are found early in the course The patients are not necessarily those who are likely to progress on into hepatic coma but their prognosis is poor for speedy recovery Ascites sometimes of large amounts spider angiomas and esophageal varices develop Varices sometimes are encountered within a week of the onset of illness They do not appear to be a particular threat as far as hemorrhage is concerned under these

circumstances Liver biopsy specimens show that all of the hepatic injury is acute and that pre existing cirrhosis cannot be blamed for these manifestations

Clinical recovery is usually complete and almost always is attained a considerable period before liver function tests return to normal The exceptions are development of liver failure and coma or progression to one of the posthepatitis syndromes For endemic infectious hepatitis as it is being observed in this era the total period of illness averages about a month and a half

LABORATORY FINDINGS

There is leukopenia during the pre icteric phase Soon lymphocytosis develops and ex amination of blood smears shows large num bers of large atypical lymphocytes The majority of patients also develop macrocyto sis In an occasional epidemic eosinophilia is a prominent feature

Hepatitis is a hepatocellular disease and the liver function tests react accordingly Although they do not provide the diagnosis they may give information useful in evaluat ing the progress of both liver damage and repair This is especially helpful for prognostic purposes towards the end of the clinical course A battery of whatever liver function tests one likes to use or finds available to him may be repeated at intervals of about two weeks throughout the course Bromsul falein retention is one of the first labo ratory abnormalities to be demonstrable and often it is the last to become normal again therefore it provides important information Measurement of the progress of serum bilirubin retention is helpful in identifying the beginning of hepatitis resolution When *jaundice is present the actual total serum* bilirubin level is of interest only for curiosity s sake It is important to understand that clini cal jaundice lags about 48 hours behind serum icterus in its inception fluctuations and disappearance Fractionation of the one minute value can be of a little help in dif ferential diagnosis but it does not prove useful for prognostication Bilirubinuria can usually be detected two or three days before jaundice appears The flocculation tests may provide help in excluding causes of jaundice which are not dependent on hepatocellular *necrosis but they give very little quantitative* information about hepatitis The cephalin cholesterol flocculation test ordinarily be comes positive before the thymol turbidity test Direct mensuration of the serum proteins is not particularly helpful early in the course unless information is being sought on the possibility that there is underlying chronic liver disease In any acute liver disease it is wise to obtain periodic information about the prothrombin time The serum iron is elevated more consistently in viral hepatitis than in any disease other than hemochromato sis but again no special clinical use can be made of this information When liver cell destruction is especially severe and there is a prominent cholangiolitic element the results of liver function testing will be more like those of obstructive jaundice as will be mentioned

In an occasional patient there may be enough question of the diagnosis early in the course to warrant liver biopsy This is es pecially so in cholangiolitic hepatitis The amount and importance of the information to be gained are considerable particularly when the early clinical findings raise the possibility of an acute surgical abdomen as they sometimes do The only reason for advising against routine early liver biopsy is that the histopathologic state of the liver can ordinarily be predicted without it The danger of laparotomy in the face of early acute hepatitis is so great however that when the problem of possible surgical ab domen arises one should not hesitate to *biopsy*

The histopathologic course of events in viral hepatitis revolve about the processes of hepatocellular necrosis and inflammatory cellular infiltration (Fig 177) Necrosis be gins and remains most severe at the center of the liver lobule but it may spread through out the lobule During recovery the in flammatory cells merely recede and the

parenchyma regenerates itself through proliferation In the great majority of cases the end result is anatomic normalcy

TREATMENT

Most viral hepatitis is a self limited disease and one can do relatively little to speed the process of recovery On the other hand patients with this disease respond however to suggest that there is justification for enforcing bed rest The patient is ordinarily glad enough to stay in bed until his jaundice is at least a few days old Then he feels well enough to be up part of the day and this does not seem to prolong the course Quite naturally his activity must be limited to some extent until his jaundice has cleared and appetite returned Quite



FIG 177 Viral hepatitis Liver biopsy specimen taken two weeks after onset of jaundice

particularly well to the benefits of general supportive measures First among these must be the comprehensive therapeutic approach of a gastroenterologist who understands that the illness is creating personal problems for the patient The time this requires of the doctor is as nothing compared to the benefits accruing to a patient who knows he is in contact with his doctor

Bed rest seems useful during the acute phase of the illness There is no evidence

naturally too no favor is done for the patient if his doctor s words are interpreted to carry threats of a prolonged course or residual liver disease if prescribed activity limitations are overstepped Here is an important way to begin prophylaxis against posthepatitis emotional disability

The best diet for the hepatitis patient is the normal diet No dietary element should be restricted and none emphasized The possible dangers of excessive protein intake have

been discussed above Fats should not be withheld because they do no harm and because they are important for making food attractive enough to encourage the optimum intake of about 3000 calories daily During the acute phase when there are nausea and anorexia it may be necessary for a few days to make the poor substitution of intravenous glucose and saline solution for food Rarely is peroral tube feeding necessary Because there is reason to believe that vitamin requirements are unusually high or utilization is poor during the active phases of hepatitis supplementation seems in order Administration of extra doses of vitamin B seems to have special merit

Corticosteroid therapy is rarely indicated in viral hepatitis It may exert a remarkably beneficial effect on anorexia and may speed recession of jaundice but it does not shorten the course or lessen the long run dangers of the disease When hormone therapy is discontinued the subjective and objective manifestations return to where they would have been had no steroids been used and in addition the patient will have been exposed to the dangers and disadvantages of this class of drug If there is a place for cortisone it is in treatment of the severely ill patient for whom a little extra time is desirable at the onset for stimulation of food intake

Rehabilitation therapy is an important responsibility and many posthepatitis problems may be avoided if this is handled intelligently Rehabilitation has three purposes to help the patient return to his prehepatitis physical emotional and social status He has been away from his work his usual physical exercise and his usual sources of mental stimulation for a month or more At least two weeks are ordinarily required by him to get back to normal Rehabilitation may be started when the total serum bilirubin has fallen to about 1 5 mg per 100 ml and bromsulfalein retention to about 8 per cent in 45 minutes The results of laboratory tests however are not very helpful in deciding when the patient is well If clinical observation shows that recovery has occurred stable laboratory results at whatever level sanction initiation of rehabilitation efforts Following through with interview contact help with specific personal problems and graded physical exercise are the main therapeutic responsibilities Physical therapists and social service workers can help implement these

THE POSTHEPATITIS SYNDROMES

About the whole matter of posthepatitis illness there has been much and vehement disagreement but perhaps its reputation of inscrutability has been forced artificially on a matter which is actually relatively simple Although complete symptomatic and anatomic recovery is the rule in hepatitis three sequels may be encountered A small proportion of patients develop cirrhosis Perhaps they would have anyway or perhaps the beginnings of cirrhosis had been present before the patient developed hepatitis More likely hepatitis can predispose to cirrhosis Sometimes the eventual fibrous pattern is that of portal cirrhosis but more often the cirrhosis is the postnecrotic or coarse nodular type There is no question but that the severity of initial hepatocellular necrosis has much to do with the possibility of later cirrhosis and that the general virulence of the virus strain and the defensive devices of the patient s liver are the important factors controlling hepatocellular necrosis But there seem to be other mechanisms at work too for as yet it cannot be said that a severe epidemic leaves more chronic liver disease behind than does a mild one Alertness to the problem of posthepatitis cirrhosis is however a rather recently publicized responsibility of the profession and not enough time has elapsed since the great World War II epidemics to permit conclusions

A second group of patients develop chronic hepatitis In them jaundice sometimes lasts for months and hepatomegaly for years Both may however eventually return to normal Bromsulfalein retention often becomes stabilized at a rather high level but the other function tests give variable and unpredictable results The characteristic find

ing upon liver biopsy is persisting round-cell infiltration within the periportal areas Except for mild scattered fibrosis the remainder of the microscopic morphology is rather normal The possibility that this complication may develop cannot be predicted from the severity of the acute phase and even patients who are hardly sick at all at the onset sometimes run remarkably long courses Perhaps viral activity persists this long and is the explanation certainly the vigor with which initial therapy is carried out is not nor is the general state of the patient s health The patient is often considerably disabled by his chronic complaints of incessant fatigue simple dyspepsia multiple dietary intolerances mild diarrhea and mental depression His enlarged liver may ache whenever he exerts himself and the result may be inability to earn a living Emotional maladjustment is often the most important of his problems and for this interview therapy often furnishes a good answer

The most common sequel to viral hepatitis is simple emotional invalidism without residual organic disease This condition must not be confused with chronic hepatitis Here the liver is normal in size and histologic structure and liver function tests are normal or almost so The patient s subjective problems are quite variable but in general they are similar to those which were evident during the acute phase of his disease Inability to adjust to the state of illness during the active phase now becomes outspoken dependency on family and medical personnel If there is an important secondary gain factor there is likely to be close to total disability This is not an attractive type of clinical problem and one sometimes observes hostility of professional origin heaped upon the patient This of course is an inexcusable thing Much can be done for the patient by skillful interview therapy which is clearly the responsibility of the gastroenterologist

PROPHYLAXIS

The problem of prophylaxis of infectious hepatitis is made difficult by lack of technics for identification of and cure of the carrier state It is believed that the carrier rate for Virus IH may be as high as 1 or 2 per cent in the general population of this country In spite of efforts to decrease filth diseases through public education there is every indication that clinical hepatitis is on the increase Continued interest in clean public and private water supplies seems important for hepatitis control There is no way to measure food handlers for carrier status an important frailty of prophylactic planning It is important that the infected patient s stools be safely disposed of but the role of the sick person in dissemination of the disease is minor compared with that played by the unsuspected carrier

Publicity about the danger of syringe transmission of homologous serum hepatitis appears to have been most effective and infection secondary to carelessness has largely come under control It is important that syringes and needles be washed immediately after use in addition to their being sterilized by heat The latter may be accomplished by 10 minutes of boiling or by autoclaving or baking Transmission by blood and blood products continues to be a major problem The size of plasma pools has been reduced by the processing agencies alleviating the danger somewhat But there is no way as yet to render such materials innocuous if they contain active virus Early enthusiasm over use of ultraviolet irradiation and mere storage time for ridding plasma and other biologic preparations of the virus has been dampened by experience

Brief but effective passive immunity can be effected through use of human gamma globulin if it is administered during the incubation period As soon as an epidemic has been recognized children and adults believed to have been exposed should be given three milliliters intramuscularly

CHOLANGIOLITIC HEPATITIS

This rather rare form of hepatitis has proved an enigma for etiologic thinking At the moment it is believed to be a variant of viral hepatitis but if it is it demonstrates some important differences This is not an

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organism of Weil s disease has been found in dogs swine and cattle in addition to rats and man The infected hosts excrete the organisms in their urine for indefinite periods The spirochetes survive for several weeks in water if it is slightly alkaline It is believed that a single virulent spirochete is sufficient to cause infection Man contracts the disease when the organisms gain access to the body through the skin or any of the mucous membranes Perhaps most infections are acquired via the conjunctiva or nasal mucosa Quite obviously these are occupational diseases among those who come in contact with infected water or work closely with domestic animals They are common among sewer workers dock workers veterinarians and small boys who swim in canals

Weil s disease which has an incubation period of two to nine days usually has a sudden onset with fever rising to 103° F malaise intestinal disturbances severe headache backache and generalized muscle pain and tenderness Leukocytosis appears from the start From here on the clinical manifestations demonstrate many variations During the first seven days the disease is a septicemia but the localizing manifestations are confined largely to the liver kidneys meninges and eyes An important early sign is conjunctival injection and it is wise to suspect Weil s disease in any febrile patient who has ocular injection In the acutely ill patient suspected of early Weil s disease demonstration of splenomegaly speaks strongly against the diagnosis however splenomegaly usually develops as the disease progresses About half of the patients develop enough hepatic involvement by the fifth to seventh day to develop jaundice and there is moderate hepatomegaly in many cases In fatal instances the primary liver disease is found to be severe hepatocellular necrosis plus an intense acute inflammatory infiltration (Fig

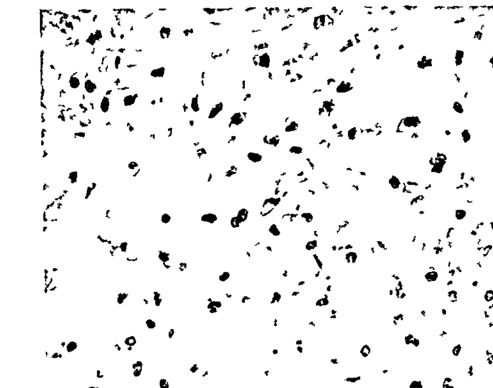


FIG 178 Acute hepatocellular necrosis in fatal case of Weil s disease Autopsy specimen

epidemic disease and it tends to affect older people more often than does classic viral hepatitis Cholangiolitic hepatitis produces an intrahepatic type of obstructive jaundice Cholangiolitic is not used in a morphologic sense but to indicate disturbance in cholangiolar physiology There is clear cut evidence of bile regurgitation through the cholangiolar walls back into the circulation via the spaces of Disse In spite of the outspoken bile regurgitation there is no abnormality within the main bile passages and no hepatocellular functional impairment develops

The histopathologic changes are easily confused with those which are secondary to actual bile duct obstruction There is inflammation in the periductal regions bile stasis and frequently bile thrombi Although at one time the latter were considered to be a probable explanation for the obstruction they are now believed to be only secondary to increased cholangiolar permeability Sometimes the histopathologic abnormalities include all of the changes which are typical of classic viral hepatitis In any event the process is a very chronic one The concept of progression to a specific cholangiolitic cirrhosis as the final stage has been proposed from time to time but it is questionable whether a special entity is required to explain the late clinical phenomena sometimes observed When cholangiolitic hepatitis progresses to chronic fibrous liver disease the morphologic end stage is the coarse nodular type of cirrhosis The functional disturbances in biliary physiology continue as before

Clinically cholangiolitic hepatitis begins much as does ordinary viral hepatitis but obstructive features quickly become apparent Then as might be expected from the altered physiology the picture may become much like that of common duct stone or chlorpromazine hepatitis There is ordinarily no eosinophilia however and there is a much better chance of a very chronic course Jaundice may persist for a few or several months There often is severe pruritus Physiologic intrahepatic obstruction causes retention of serum bilirubin alkaline phosphatase and cholesterol Circulating lipids are increased The stools may become acholic from time to time although the urobilinogen content of the urine ordinarily remains normal The flocculation tests are normal or almost so During the active stage cholegraphic dye is not able to pass through the liver in sufficient quantity to produce radiopacification of the gallbladder

Management is entirely similar to other forms of hepatitis The jaundice can be expected to be prolonged and the whole course very chronic It is apparent that differentiation between cholangiolitic hepatitis and surgical obstructive jaundice always must pose a problem and that at times the patient will be operated upon with full confidence that a common duct stone or other extrahepatic obstructing lesion will be found There is no certain way of avoiding the error Because cholangiolitic hepatitis is a rare disease it may escape consideration in differential diagnostic thinking simple awareness is a good part of the solution

THE LEPTOSPIROSES

At least six of the several varieties of leptospirosis have been documented in this country Weil s disease (*Leptospira icterohaemorrhagiae*) canicola fever (*L canicola*) Indonesian Weil s disease (*L batavia*) swine herd s disease (*L pomona*) pretibial fever (*L autumnalis*) and water fever (*L grippotyphosa*) Infection due to one organism differs from infection by another chiefly in the severity of the clinical picture This picture is notoriously deceptive to the clinician because it often simulates closely that of many other acute infectious diseases such as viral hepatitis poliomyelitis and infectious mononucleosis Leptospiral infections are widespread among domestic animals and wild rats in this country and man becomes infected from them About 25 per cent of dogs in certain surveyed areas have been found infected with *L canicola* and up to 60 per cent of brown rats with *L icterohaemorrhagiae* Although *L canicola* infection appears to be confined to dogs and man the

organism of Weil's disease has been found in dogs swine and cattle in addition to rats and man The infected hosts excrete the organisms in their urine for indefinite periods The spirochetes survive for several weeks in water if it is slightly alkaline It is believed that a single virulent spirochete is sufficient to cause infection Man contracts the disease when the organisms gain access to the body through the skin or any of the mucous mem

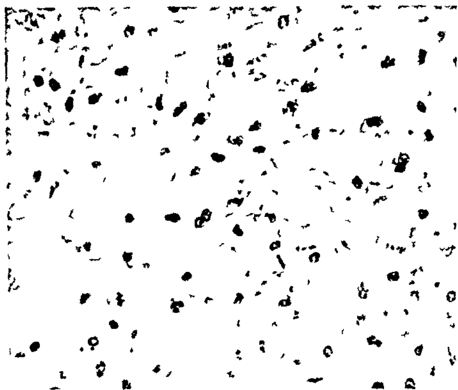


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178) It is probable that a hemolytic element contributes to the degree of jaundice Kidney involvement manifests itself as acute nephritis About 10 or 15 per cent of patients are sick enough to demonstrate both jaundice and oliguria Anuria is rare There is a hemorrhagic tendency and evidences of meningeal irritation are common Sometimes the clinical picture is that of acute meningitis and nothing else Cardiac arrhythmia and congestive heart failure are unusual manifestations If there are late sequels these take the form of uveitis and iridocyclitis Chronic meningitis has been reported

Laboratory confirmation of the diagnosis is based on bacteriologic and immunologic study Darkfield examination of the blood and spinal fluid during the first seven days of illness and of urine after the tenth day often reveals the organisms but there are too many artefactual hazards to permit safe diagnosis by this means It is best to culture blood and spinal fluid on Fletcher s medium and to inoculate urine into animals Unfortunately cultures occasionally do not show positive results for as long as four weeks Important tests are serial measurements of the complement fixing titer and of the agglutination lysis titer These are believed to be reliable diagnostic aids although there are cross reactions among some of the species

Treatment must be largely supportive Although many antimicrobial agents have been found spirochetostatic *in vitro* and in experimental animals none has proved particularly helpful for clinical infections This is fortunately a self limited disease Spirocheturia may persist for at least several weeks following clinical recovery

AMEBIASIS OF THE LIVER

There is something about the liver which is antagonistic to *Endamoeba histolytica* The rarity of amebic infection here can be explained only on this basis If one is carrying an experimental amebic infection in the colon of dogs he must not feed them liver because this will cure the amebiasis In both animal and human autopsy material it can be demonstrated that amebae frequently enter the veins of the colon wall in cases of amebic colitis and therefore must be carried to the liver in large numbers But here they are inactivated Judging from studies following injection of large numbers of amebae into the portal vein this ordinarily happens within a day or two

AMEBIC HEPATITIS

It is difficult to know what to think about amebic hepatitis There is a condition in some people who have amebic colitis which is characterized by liver enlargement right upper abdominal quadrant tenderness and disturbed liver function tests without abscess formation This has been defined as a complication of amebic colitis by many experts and is spoken of by them as one which should be diagnosed frequently by the clinician—in 5 per cent of all amebiasis patients according to some But in clinical practice differentiation of amebic hepatitis from coincidental liver disease is very difficult to make with any conviction Furthermore because of the frequency with which the liver responds to any ulcerative large bowel process by slight nonspecific swelling it is a serious mistake to assume that every liver sign and symptom in the amebiasis patient indicates amebic hepatitis

The main problem is that solid histopathologic proof of the existence of amebic hepatitis cannot be found Specimens removed by liver biopsy in suspected cases may show small areas of focal hepatocellular necrosis and mild round cell infiltration of the portal areas *E histolytica* however can never be identified and the observed changes are too nonspecific to permit etiologic interpretation Often one finds other familiar liver pathology and then it becomes evident that the amebiasis and the liver disease were coincidental conditions

Even though an etiologic connection cannot be proved or even suspected strongly the fact remains that the person who harbors amebae in the colon sometimes develops the clinical picture of acute hepatitis Less frequently a more chronic type of hepatitis de

velops The liver becomes mildly enlarged and very tender there is sometimes an irregular fever and the patient loses his appetite Often leukocytosis develops and although leukocytosis is occasionally found in viral hepatitis and often in noninfectious types of hepatitis this is a diagnostic feature to be reckoned with It is said that this type of attack may clear in a few days but it is difficult to see how this could be if actual liver injury is at fault Treatment aimed at demonstrated amebic colitis is all that is indicated

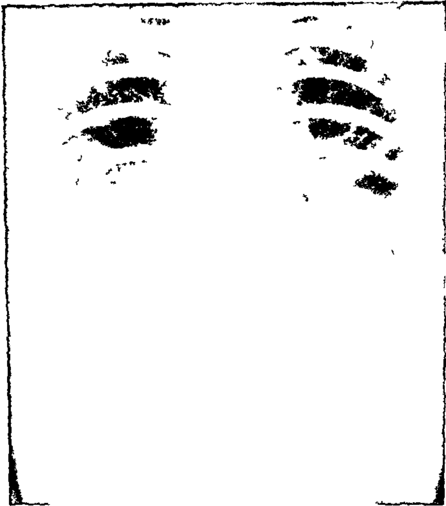


Fig 179 Amebic liver abscess of crest of right liver lobe

AMEBIC ABSCESS

Amebic liver abscess is quite a different problem from amebic hepatitis In some parts of the world it complicates as many as 2 per cent of symptomatic amebic colitis cases It is considerably rarer in areas where amebiasis of the colon tends to be mild in its clinical manifestations There is nothing to suggest that climate is directly responsible for this difference rather it is probable that the general state of the population s nutrition and the prevalent strain of the responsible organism are the explanations

As indicated above it is believed that when the colon wall is infected with *E histolytica* the liver is showered from time to time or perhaps continuously with amebae via the portal circulation If they eventually are able to establish themselves and thrive in this un

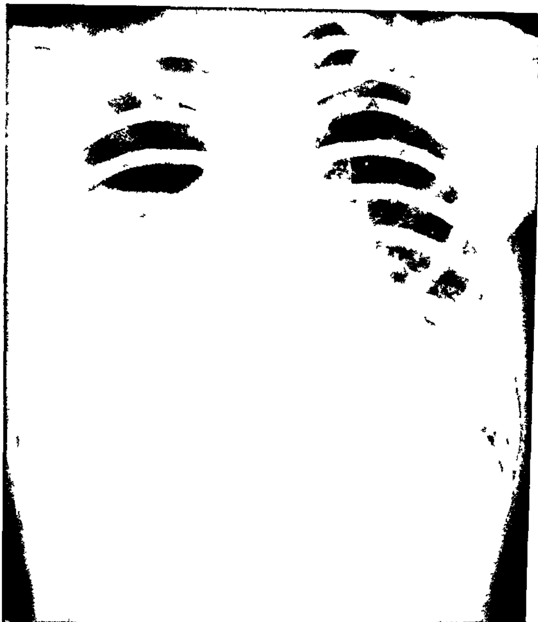


FIG 180 Amebic empyema following rupture of liver abscess Three weeks following situation shown in Figure 179

favorable medium abscess is the result Liver parenchyma is destroyed by the organism s cytolysins and the liquid products of miliary focal necrosis collect in a wall less cavity The amebae cannot survive in the abscess contents and all amebic activity is confined to the living liver tissue at the periphery of the lesion An amebic abscess then is characterized by continuous growth and ill defined walls Often several abscesses of varying size are present early in the course These tend to become confluent with continued expansion so that finally a very large solitary lesion with a few small satellite abscesses is usually found The right lobe is always involved with or without additional abscesses in the left lobe (Fig 179) In a few instances hepatoma formation has been observed in the region of an amebic liver abscess but the implications of this are speculative

The products of hepatic cytolysis accumulate as a heavy dark brown or red material

which classically has been likened to anchovy sauce Not many doctors have had as much experience with anchovy sauce as with amebiasis but when the material is obtained by aspiration of a liver abscess all must agree that its appearance is quite different from that of any other material which may be obtained from the body Sometimes an amebic liver abscess becomes secondarily infected by colon bacteria and then its contents appear more like familiar pus

The clinical picture is characterized by the signs and symptoms of both severe local infection and severe generalized reaction There are acute and chronic clinical forms but the latter is merely a drawn out version of the former The liver becomes enlarged and very tender In some patients the area of tenderness is remarkably small and it may be inaccessible to direct palpation because of the chest wall If the abscess approaches the superior surface of the right lobe the right diaphragm becomes paralyzed sterile right pleural reaction develops and the patient may be bedeviled by incessant coughing A large lesion near the anterior or lateral surface of the liver may produce visible bulging of the upper abdomen chest wall or flank Meanwhile the patient complains of local pain fever sweats great weakness and profound malaise There is increasing fever of a septic or an irregular sustained type weight loss and eventually emaciation

Large amebic liver abscesses show a moderate tendency to rupture This is most likely to occur from the superior surface of the right lobe through the adherent diaphragm The abscess contents may pour into the pleural cavity (Fig 180) but more often the base of the lung has become adherent due to prior pleural reaction and a hepatobronchial fistula is immediately formed Sometimes an abscess ruptures suddenly into the transverse colon followed immediately by passage of the abscess contents per rectum There may be erosion through the chest wall into the mesentery into the retroperitoneal structures etc

The laboratory may help with the diagnosis in an indirect fashion Experience from all parts of the world indicates that one can expect to identify *E histolytica* in the stool at the time an abscess is discovered in only about half of the cases Percutaneous aspiration of the abscess cavity by syringe and needle a safe and proper diagnostic procedure when a sizable liver abscess is suspected helps considerably by providing material for gross identification although it does not deliver amebae Almost always the walls of the cavity must be scraped if one is to be assured of material which will contain the organisms Following repeated aspiration of the cavity the chances of finding amebae in the reaccumulating liquid are a little bit better From the outset there is leukocytosis and this may occasionally rise to very high levels Usually the flocculation liver tests and serum bilirubin remain normal Frequently however alkaline phosphatase activity and bromsulfalein retention are increased With progressive weight loss anemia and hypoproteinemia develop

Roentgenologic evaluation of diaphragmatic activity and of the presence of pleural reaction or effusion is important The configuration of the superior profile of the liver s right lobe may provide early evidence of the lesion s presence At the time treatment is begun it is helpful to inject a radiopaque solution to permit estimation of the size of the cavity

Treatment must be directed at both the infection within the liver and the amebiasis in the colon The latter is discussed in the chapter on the colon The presence of parenteral amebiasis demands emetine hydrochloride therapy No modern pharmacologic innovation has improved on emetine for this disease A course of 0 065 gm intramuscularly daily for seven days to be repeated if necessary is recommended with observation of the usual precautions against its rather mild toxic potentialities It is to be noted that several other chemotherapeutic agents have been used for many patients during the past few years with results which appear to have been good Notable among these drugs have been chloroquine Atabrine and some of the newer anti

microbials None has equalled the proved effectiveness of emetine

The general surgical principle that every abscess must be drained applies to amebic liver abscess as it does to lesions of bacterial origin The abscess must not be incised however except under most unusual circumstances If it is large enough to cause distortion of liver configuration repeated percutaneous aspiration of the cavity with a large needle and syringe begun with the initial diagnostic aspiration should be carried out at intervals of about two days Although it would be desirable to empty smaller lesions too blind needle exploration of the liver is too traumatic and insufficiently productive to be warranted If liver distortion has been produced by multiple abscesses which have not yet become confluent the yield upon aspiration will be poor but this cannot be known short of exploratory needling Some surgeons routinely instill penicillin solution into the cavity fol*lowing aspiration for treatment of or pro*phylaxis against secondary bacterial infection It is probably best not to flush with any antiseptic solution and antiamebic drugs do no good within the abscess cavity The thick abscess contents are very susceptible to the liquefying action of streptodornase and if they cannot be withdrawn satisfactorily it is probably wise to insert two catheters into the cavity through a trocar for flushing with streptokinase streptodornase Although a new technic this promises to provide adequate and rapidly effective local therapy

HYDATID CYST

Hydatid disease or infection with the larval form of *Echinococcus granulosus* is the only human manifestation of echinococcosis Man is merely an accidental host for this parasite The tiny adult tapeworms live in the intestines of dogs and closely related animals being acquired through the ingestion of animal carcasses which contain larval hydatid cysts The worm s life history calls for the sheep or hog as the usual host for its larval stage although a great many other animals are susceptible The dog spreads infection *through its egg* laden feces and man like other secondary *hosts acquires hydatid disease from objects* which the dog has contaminated As a filth disease it is potentially controllable but the requirements of the worm s biology have continued to be satisfied *in spite of minor changes* in the sanitary mores of endemic areas It is rare in the United States

The swallowed tapeworm egg hatches to release a hexacanth embryo which quickly invades the intestinal mucosa It enters the portal venous circulation as a posthexacanth embryo and is carried to the liver In most cases it settles and matures here Less commonly the kidney or spleen is the site of development All but 1 per cent of abdominal echinococcosis begin in one of these three organs but the mature cyst tends to metastasize to or rupture into other areas and organs Surgical manipulation is notoriously effective in encouraging dissemination The hydatid has these potentialities because in its fluid are *suspended numbers of self sufficient daughter* embryos In most instances all germinal activity is confined to the cyst s unilocular insides and rupture is required before there can be spread This is the benign hydatid Occasionally the outer surface of the cyst shows germinal activity too and the result is production of daughter cysts which may spontaneously metastasize to all parts of the body This is the malignant alveolar form

Hydatid disease of the liver is characterized mainly by slowly increasing hepatomegaly slow compression and displacement of hepatic substance and *by pressure on regional organs* Its presence may not be recognized until the cyst has grown for years Spontaneous or traumatic rupture often proves to be a catastrophe not only because of the implications regarding dissemination but also because sudden release of the cyst s fluid contents is usually attended by severe anaphylactoid shock The course is not always progressive because sometimes the embryo dies This is usually caused it is believed by bacterial infection of the cyst but perhaps death sometimes comes first The fluid then is resorbed *the cyst partially collapses* and the wall de

generates eventually to undergo calcification Clinical improvement follows and the threat posed by the parasite is gone

There are few deliberate clinical or laboratory studies which help diagnosis and if there has been no calcification for the roentgenologist to demonstrate the cyst may be discovered only by surprise at operation The patient is not made systemically ill unless there has been dissemination Urticaria like eosinophilia is encountered only very early in the infection long before the presence of the parasite can be demonstrated The liver becomes enlarged but there is no tenderness A bulge may present from some part of the organ It may be possible to demonstrate the tremor of lax encapsulated fluid All radiologists are alert to the possible echinococcal implications of calcified cyst rims within the liver and in some areas of the world a detailed roentgenologic classification of hydatids is in constant use Rarely as a diagnostic happenstance a cyst may rupture into the gastrointestinal tract and daughter cysts and the characteristic hooklets may be recognized and identified in vomitus or feces Puncture of a hydatid for diagnostic purposes is dangerous but since it is for diagnostic purposes the danger will probably not be recognized until it has been done Microscopic examination of the aspirate permits specific diagnosis when it contains hooklets There are several immunologic tests available and these are helpful if one thinks to use them The Casoni skin test is endowed with a good degree of specificity Unfortunately it remains positive indefinitely so it cannot be used to determine cure following surgical extirpation of the cyst

If a hydatid is judged to be alive it must be removed surgically intact and without spillage of its contents Rather than risk surgical dissemination however it is best to leave the cyst undisturbed if exploration suggests too many technical problems in extirpation in anticipation that it will eventually die spontaneously Under these circumstances one may instead choose to aspirate the cyst and instill Formalin solution in hopes of killing the larva This procedure has not proved entirely satisfactory and is not without danger

SCHISTOSOMIASIS

Schistosomiasis is one of the major public health problems throughout the world and in some regions it is the major threat to general health Schistosome species capable of producing visceral infection in man are not native to the United States their distribution being controlled closely by available snail intermediate hosts Clinical schistosomiasis which is encountered in this country has three main sources Puerto Rican immigrants especially in New York City and in the Armed Forces World War II servicemen who acquired infection in the Philippine Islands and scattered immigrants or visitors from other endemic areas Schistosomiasis japonica and Manson s schistosomiasis are parasitologically diseases of the bowel but clinically liver disease becomes the important problem in most cases Schistosomiasis haematobium is unimportant as a cause of liver disease

Schistosomal infection is acquired through skin contact with water containing the free swimming furcocercarial larvae which are spewed forth from infected snails The worms develop into adults within the smaller veins of the portal system The females oviposit against the portal current and most of the eggs in time are transported from the bowel s venous radicles through the tissues as foreign bodies to be extruded eventually into the lumen of the bowel Some eggs are carried past the worms by the portal flow and then are caught by the liver or rarely by other organs

Egg seeding of the liver appears to be a slow continuous process and reactive damage takes years to become important Chronic liver disease is therefore a late sequel of schistosomal infection In endemic areas people ordinarily become infected during childhood and if the worm burden is light clinical problems may not arise until middle adult life or not at all Infection with *Schistosoma japonicum* is more serious than a comparable infection with *S mansoni* About each egg or group of eggs the liver produces a

small nonspecific type of granuloma with a zone of neutrophils eosinophils and foreign body giant cells surrounded by a narrower zone of mononuclear cells With the passage of time a heavy fibrous reaction develops and the final picture is that of cirrhosis

Portal hypertension and esophageal varices constitute a serious threat to the patient with either type of visceral schistosomiasis Young apparently healthy people with subclinical infection often have large varices and sometimes they bleed seriously Portal hypertension has two mechanical explanations in this disease both operating simultaneously in most instances there is the effect of the parenchymal egg granulomas and the fibrosis and lobular regeneration they may elicit and there is the direct obstructive action produced in the walls of the portal vein system itself by egg granulomas and fibrosis In addition portal vein calcification and thrombosis may follow intramural egg deposition

Diagnosis of Manson s schistosomiasis and schistosomiasis japonica is ordinarily a simple matter even in light infections Stools may be examined for the eggs by various concentration technics but one cannot rely on negative results no matter how many specimens are examined Trans sigmoidoscopic rectal mucosal biopsy mucosal scraping and rectal crypt aspiration with identification of eggs in the products are by far the best diagnostic technics one being about as effective as the others The area of the third valve of Houston is usually the most fruitful for collection of material These are blind technics the mucosa at the site of a positive mucosal biopsy or scraping almost always appearing normal through the sigmoidoscope Formation of gross rectal and sigmoidal abnormalities such as egg granulomas is a manifestation rarely encountered in schistosomiasis as it presents itself in this country

Treatment must be directed at both the infection itself and at the effects of portal hypertension if they have resulted in esophageal varices It is important to understand that treating the infection i e killing the adult worms does not improve the clinical or pathologic manifestations as they stand at the time of treatment It merely prevents further oviposition It provides only partial prophylaxis against further disease for changes in the liver continue in response to damage already done The level of portal hypertension is not reduced by death of the schistosomes

The worms are best killed or at least prevented from further oviposition with the help of the antimonial drugs For Manson s schistosomiasis fuadin is probably the best provided an adequate dose is used A total of 150 ml of the 6 3 per cent solution is recommended this being considerably in excess of the older but rather ineffective regimens Daily 5 ml are given intramuscularly with brief rest periods if joint pains become excessive For schistosomiasis japonica tartar emetic is the best drug and it is entirely adequate for Manson s schistosomiasis as well It is given intravenously 0 15 gm daily until 2 5 gm have been administered Here too nothing is lost if the course must be interrupted for a few days Antimony is a cumulative medication and has a reputation for toxicity Toxic reactions are more of a clinical nuisance than a cause for serious concern Back and joint pains are common during the course of treatment but do not necessitate cessation of therapy although a rest may seem advisable from time to time Butazolidine treatment is very effective in managing complicating arthralgia but routine prophylactic use is not indicated Nausea and transient psychic disturbances are not uncommon Nonspecific electrocardiographic changes often develop but these clear in time

Treatment of schistosomal portal hypertension is discussed under that general subject There is no need to worry about dissemination of eggs through the body if a portacaval shunt is created while eggs are still being laid because sidetracking native portacaval shunts have been in operation all along One may proceed with surgical portal decompression even though the worms are still viable and begin antimony therapy shortly after operation

THE LIVER IN CERTAIN SYSTEMIC INFECTIOUS DISEASES

It is fair to say that any systemic infectious disease influences the liver adversely to some extent Although a certain myopia results when one picks out a single organ such as the liver to discuss separately in this connection there are a few points which might be men tioned as of significance in liver pathology

For some years there was controversy about the specificity of the jaundice which occurs in about 5 per cent of patients with *infectious mononucleosis* a few or several days after clinical onset With wider use of liver biopsy technics it has been found that mild and unimportant acute liver involve ment is a regular accompaniment of this disease not to be considered a complication Round cell infiltration through the portal areas and sinuses is the main change although occasionally mild hepatocellular necrosis also occurs Sometimes the nonspecific type of tiny granuloma is found There is no architec tural change and it is inconceivable that by itself infectious mononucleosis could be a precursor of portal cirrhosis The clinical picture in those patients whose liver is es pecially hard hit is similar to that of mild or moderate viral hepatitis The liver function tests show the expected response and often moderate abnormalities are observed especi ally in the flocculation tests even when clinically there appears to be no significant liver disease

Liver injury is common in *brucellosis* as would be expected from the frequency with which hepatomegaly occurs in all forms of the disease Almost always some abnormality can be found upon liver biopsy usually tak ing the form of lymphocytic infiltration and excess fibroblastic activity In half the cases a random biopsy specimen includes granu lomas Brucellosis granulomas which are characteristic but not diagnostic develop in great numbers through the periportal areas and within the lobules Focal necrosis may accompany the granulomas and in fact may represent the first stage of granuloma forma tion Even though the findings upon liver biopsy are not specific liver tissue obtained this way often upon culture provides the specific organism There seems to be no ques tion but that portal cirrhosis is an occasional sequel

Miliary *tuberculosis* of the liver is very common and has been reported at autopsy in as many as 80 per cent of patients who have died of tuberculosis Although the hepatic part of the disease is of no special additional concern in most patients with miliary tuberculosis occasionally the hepatic complaints and signs dominate the clinical picture Rarely is there jaundice but some degree of hepatomegaly is almost always found The results of liver function tests are similar to those observed in cholangiolitic hepatitis—abnormal retention of serum biliru bin alkaline phosphatase and cholesterol Presumably this is due to compression and destruction of cholangioles by the miliary lesions Much rarer are hepatic tuberculomas and tuberculous abscesses Rare too is tuber culosis of the intrahepatic bile ducts desig nated the tubular form of hepatic tuber culosis This may be a very destructive process with duct dissolution obstruction and formation of multiple caseating areas through the parenchyma Occasionally tuber culosis of the lymph nodes about the extra hepatic bile ducts is responsible for biliary obstruction Formation of a tuberculous biliary fistula is an important hazard of oper ative management

Syphilis is of course always a systemic dis ease at the start and the liver always becomes infected When syphilis is congenital this may lead to diffuse hepatic fibrosis and pseu dogumma formation In the primary and secondary stages of adult syphilis a rather severe hepatitis may develop and even pro ceed to massive hepatocellular necrosis The hepatic gumma of tertiary syphilis is be coming a rare lesion When the scar tissue of a gummatous liver contracts the deformity of classic hepar lobatum is produced Almost all cirrhosis of syphilitic patients is simple unrelated portal cirrhosis

Sarcoidosis a condition which seems to represent a peculiar form of tissue response to many types of stimulating process rather regularly includes histopathologic changes within the liver The typical minute granulomas of sarcoidosis are scattered through the otherwise unaltered parenchyma discrete and without peripheral reaction Hepatomegaly may be produced although study of the liver s histopathology makes one wonder why its volume should be increased Liver biopsy may furnish considerable help in the diagnosis of sarcoidosis but if the yield is to be high two or three specimens should be taken from each patient and all of the tissue in each specimen should be sectioned and examined Some reports of very high percentages of positive random biopsy specimens in this disease are misleading It is possible for mural sarcoidosis of the intrahepatic portal vein branches to produce portal hypertension

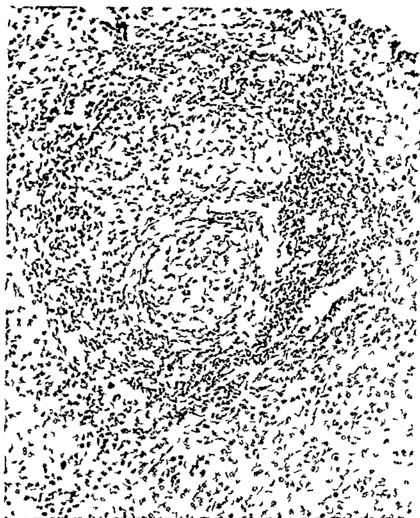


FIG 181 Nonspecific granuloma of the liver found in liver biopsy specimen from patient who had no known reason for granuloma formation *This is not a rare finding among any series of liver biopsies*

Granulomas of the liver develop in many conditions other than those just mentioned some infectious and some not such as tularemia lymphogranuloma venereum Hodgkin s disease actinomycosis histoplasmosis and beryllium poisoning In addition granulomas may be found by chance in biopsy specimens from patients who seem to have no reason at all to develop granulomas (Fig 181)

Granulomas which remain etiologically unexplained appear very much like some of the specific granulomas microscopically They are tiny and tend to be scattered at random through the liver substance There are giant cells of the foreign body type at the center mononuclear cells in a rather broad zone about them and an encircling shell of connective tissue stroma Ordinarily no other histologic abnormality of the liver is found although some of the specific granulomas such as those due to schistosomiasis play an important part in the eventual development of cirrhosis

PYOGENIC LIVER ABSCESS

Pyogenic abscess is a dangerous process when it develops in the liver and fortunate it is that it is a rare disease Why it should be rare is not clear in view of the fact that the liver filters the drainage from such a large bacteria laden area The liver obviously has special protective powers against bacterial invasion and these can be broken down only under certain special circumstances Direct trauma is the most obvious although it is not often responsible For instance even though culture of liver biopsy specimens from humans almost never shows bacterial growth as opposed to the situation in some lower animals contusion of the liver is frequently followed quickly by establishment of bacterial infection at the site Whatever the source of infection an abscess is much more likely to develop in the right lobe than the left In the case of solitary lesions this preference is shown in about 80 per cent of cases If there are multiple abscesses the largest number are always found in the right lobe Within the lobe itself there is no preferential distribution except when the lesion develops through continuity

Specific etiology of liver abscess is quite varied Well established tumors tuberculomas and fungus granulomas may rarely undergo necrosis with establishment of secondary infection within them Amebic abscess a rather special class more frequently becomes so complicated When abscess follows penetrating wounds liver contusion or the lodgment of foreign bodies the agent is usually one of the gas forming organisms In no other location does *Clostridium* spp infection behave more ruthlessly When the source of infection is the portal vein as it is in the majority of cases abscess is often associated with pylephlebitis Here the lesion is a pyogenic one and the usual organisms are the colon group streptococci and staphylococci the incidence of the three being about the same Less commonly *Salmonella* spp Friedlander s organism and others are responsible The same organisms are ordinarily found in abscesses which are secondary to biliary obstruction and to acute cholangitis In neonates infection may reach the liver via the cord stump and umbilical veins and then staphylococci are usually found to be responsible The liver receives its share of seeding via the hepatic artery whenever there is septicemia although in this situation the organ s defenses seem rather efficient in localizing and taking care of the many foci where bacteria come to rest Finally near by abscesses can on occasion extend into the liver substance

CLINICAL ASPECTS

The incidence of liver abscess is about 0 03 per cent for general hospital admissions and about 1 0 per cent among autopsies The incidence is not declining apparently and one explanation is the increasing use of cortisone and corticotropin for treatment of regional enteritis and ulcerative colitis Liver abscess is a very rare complication of ulcerative colitis but it is not an uncommon complication of ulcerative colitis which is treated with steroid hormones The age incidence of patients with liver abscess is governed by the age incidence of its sources Because appendicitis is the most common cause of portal vein borne infection the appendicitis age group predominates in most series The neonatal group as explained is very small The moderate incidence among older people is due mainly to septicemia and to diverticulitis of the colon

The pyogenic type of abscess creates the main clinical problem A curious phenome

non is noted here quite unassociated with the bacterial species involved A solitary abscess even though very large behaves differently from multiple smaller abscesses and the clinical picture which it produces may at times be distinctive enough to permit the clinician to recognize its solitariness A solitary pyogenic abscess usually acts like a primary abscess In at least three quarters of the cases a source for bacterial invasion of the liver cannot be located even at autopsy The clinical manifestations tend to direct attention to the liver and there is no overt infection elsewhere in the abdomen to complicate the picture Multiple pyogenic abscesses on the other hand usually develop during the course of an outspoken infectious process which already has been recognized Liver involvement then comes as a complication of an obviously primary infection elsewhere and even though it immediately must be recognized as the most threatening part of the picture the therapeutic focus must necessarily be divided Diagnosis always perhaps a difficult matter in liver abscess is particularly so when multiple liver lesions develop in the patient who already is severely sick with pyogenic disease

In either type of abscess the general manifestations are those of localized pus Fever is almost always the first sign of solitary abscess It tends to be sustained Daily chills spiking fever and sweats are common with multiple pyogenic abscesses rare with solitary pyogenic abscess Toxemic manifestations—nausea vomiting diarrhea headache malaise —generally show this same distinction being much more severe when there are multiple abscesses Pain comes late in both types often only after one or two weeks of more generalized manifestations have passed It tends to be dull and constant and it usually is well localized in the liver area Referral to the lumbar region occurs in about one quarter of the cases and it is said that patients with a solitary abscess commonly have pain in the right loin Respiratory symptoms become prominent if an abscess reaches the superior surface of the right lobe Then diaphragmatic and pleural irritation cause prolonged coughing spells and if pleural effusion develops a degree of dyspnea

The physical findings do not at the start lead one to suspect hepatic localization Within a few days or a week liver tenderness develops This is the most reliable local finding but if the lesion is solitary the area of tenderness may be hidden under the diaphragm or under the ribs Then local pain can sometimes be elicited by pressure over the intercostal areas or heavy percussion over the back A useful way to demonstrate tenderness in an occult area of the liver is to employ Bookman s maneuver a finger is hooked into the patient s umbilicus and pulled downward towards the pubis This exerts traction on the liver via the round ligament often uncovering deep tenderness Because an abscess which approaches the liver surface elicits local perihepatitis a friction rub can be expected This is a very helpful diagnostic sign

Hepatomegaly regularly develops but it too sometimes comes too late to assist early diagnosis Eventually the size of the liver may be doubled Large solitary lesions which are strategically located may produce palpable or visible bulging of the abdominal wall or flank There is no true muscle spasm but there may be considerable guarding Localized edema of the chest wall is said to be a reliable sign of underlying liver abscess but it is not often seen If pleural reaction is present Litten s sign will be absent There may be decreased diaphragmatic excursion plus the signs of pleural effusion Jaundice is quite unusual although pathologically there always is a degree of reactive hepatitis jaundice seems to occur only when the lesion produces mechanical obstruction of a major duct

Roentgenologic signs are of great help particularly if the responsible organism is a gas former or if the lesion has approached the superior surface of the right lobe Rarely an actual gas liquid level is demonstrable within the abscess The signs of right basal pleural reaction with decreased diaphragmatic activity give helpful diagnostic information af

though they do not permit distinction between a pyogenic and an amebic process Occa sionally a large bulging abscess produces deformity of the opacified stomach colon or kidney pelvis

The white blood cell count is always ele vated to a limit of about 18 000 in the case of a solitary pyogenic abscess and to 30 000 or more when there are multiple abscesses The anemia of chronic infection eventually develops Liver function tests are not help ful for diagnosis

Liver abscess is a dangerous disease in every case but the course may demonstrate varying degrees of chronicity Too often the best of treatment does not influence it Prob ably two to four weeks is the average dura tion for multiple abscesses before death supervenes Solitary abscess may at times persist for months There is rapid weight loss and a progressively toxic general re sponse The usual complication of solitary abscess is rupture and this may take place through the diaphragm into the pleural cavity or adherent lung substance into the peri cardial sac out into the mesentery or colon or back through the retroperitoneal structures Apparently free perforation into the ab dominal cavity is very rare due to formation of prerupture adhesions It is probably fair to say that only 5 or 10 of every 100 patients with multiple pyogenic abscesses will survive and among survivors there will be some ques tion about the accuracy of the diagnosis Perhaps 30 or 40 of 100 with solitary pyogenic abscess will survive if surgical ther apy is instituted before the lesion extends beyond the liver

TREATMENT

Support antimicrobial drugs and measures directed at the primary disease or source of infection are the only available means of treating multiple abscesses and at best they prove to be rather impotent gestures If solitary pyogenic abscess is the clinical diag nosis or if there is strong clinical suspicion of such a lesion surgical intervention is in dicated The prognosis is hopeless without it The principle is to drain without soiling the serosa sometimes an insuperable technical problem It is believed by some experienced surgeons that blind needling with aspiration is a dangerous technic but in selected pa tients it may prove useful for both diagnosis and temporary therapy

PORTAL (LAENNEC S) CIRRHOSIS

Widespread use of percutaneous liver bi opsy technics has necessitated certain changes in the classic concepts of portal cirrhosis Formerly the diagnosis depended on clinical recognition of certain physical stigmas of the disease Biopsy data have shown that cir rhosis exists long before such stigmas ap pear and that consequently there is more cirrhosis in the population as a whole than is generally suspected The clinician now finds it easier to understand certain reports on autopsy incidence which seem to show that cirrhosis is as much as twice as com mon as he has been able to recognize When the latent cases—people with cirrhosis who do not believe themselves sick—are included it is found too that previous concepts of the frequency of certain stigmas and com plications have been exaggerated

This is a disease of variable importance in different parts of the world and among dif ferent ethnic groups In this country it is most common in urban areas especially those with large Italian and Oriental popula tions Highest mortality rates are reported from California New York Massachusetts and the District of Columbia while the Carolinas Alabama Utah and Texas report low rates at census time All ages are repre sented but approximately 60 per cent of patients are in their fifth or sixth decade when they first become sick Infantile cirrhosis ap pears to be a different clinical disease and has been dealt with separately In most sec tions of the country from 70 to 80 per cent of cirrhotic patients are men

ETIOLOGY

The pathologic changes of cirrhosis are governed by the liver s own individual man

ner of reacting to noxious influences not by the nature of the noxious influence itself The cause for an individual patient s cirrhosis is difficult to determine because no imprint of the specific etiologic activity is left on the liver s altered anatomy Portal cirrhosis can result from the organ s reaction to many types of unfavorable situation Study of etiology reduces itself merely to identification of those situations against which the liver rather than the brain or uterus or some other type of tissue is likely to react the most In spite of the many injurious agents and influences which are known to exist in from 10 to 15 per cent of cirrhotic patients nothing can be found to suggest an etiologic circumstance

There is too much clinical information to permit doubt about the importance of chronic alcoholism as the main stimulus for cirrhosis in this and many other countries It is not possible to specify just what it is about living a life of chronic alcoholism which causes cirrhosis to develop—the alcohol itself adulterants in it the undernutrition or malnutrition of the alcoholic life or possibly some more basic influence which is the cause for both the alcoholism and the cirrhosis But the association is obvious even when one takes fully into account the fact that some people greatly exaggerate their tales of alcoholic intake and others conceal it From series to series in this country chronic alcoholics make up from 60 to 90 per cent of patients with cirrhosis (Table 11)

When cirrhosis is considered as a world wide problem probably nutritional diseases unassociated with alcoholism Manson s schistosomiasis and schistosomiasis japonica are the main etiologic influences The degree and quality of malnutrition as opposed to under nutrition are very difficult to measure but there is not the slightest question of some basic etiologic association here Many investigators believe that it is his malnutrition problem alone which makes the chronic alcoholic susceptible to cirrhosis It is probable that long periods of dietary inadequacy are required to produce clinical evidence of hepatic injury Periods of extreme under nutrition such as those suffered for a few years by previously healthy prisoners of war do not seem especially conducive to the production of cirrhosis The evidence regarding schistosomiasis and clonorchiasis as precursors of cirrhosis is excellent and that for brucellosis is good Syphilis with the history of arsenical treatment appears prominently—to a proportion as great as 20 per cent—in some of the older listings of cirrhosis etiology Today a small number of patients give an impressive history of illness following poisoning or the use of certain medications which are known to be capable of producing focal hepatic necrosis The common toxic agents which are important in this connection are carbon tetrachloride chloroform mushrooms cinchophen phosphorus methyl testosterone and arsenicals Others particularly chlorpromazine cannot yet be evaluated for their potential chronic sequels Even in the case of the better known hepatotoxins when it comes to the individual patient one can seldom do better than wonder about an etiologic connection between the acute episode of poisoning and initiation of the long course of events which lead to cirrhosis

TABLE 11 400 CASES OF BIOPSY PROVED PORTAL CIRRHOSIS ENCOUNTERED IN WASHINGTON D C APPARENT ETIOLOGIC CIRCUMSTANCES

	%
Chronic alcoholism	66
History of viral hepatitis alone	15
Alcoholism and viral hepatitis	1
Hepatitis following yellow fever vaccine	1
Hemochromatosis	2
Schistosomiasis alone	1
Schistosomiasis and alcoholism	0 3
Long incarceration as POW	1
History of solvent poisoning	1
None discovered	12

The possible role of viral hepatitis as an incitant for classic portal cirrhosis requires special comment because of its tremendous theoretical and practical implications As the great hepatitis epidemics of World War II fade further and further into the past it is discovered that the proportion of cirrhotics

who give a history of hepatitis is increasing rapidly (Table 11) As has been mentioned under the subject of hepatitis it is important in this connection to distinguish between classic portal cirrhosis and coarse nodular postnecrotic cirrhosis The latter is well recog nized as a possible end stage of cholangiolitic hepatitis Many investigators have concluded that as far as portal cirrhosis is concerned a progressive course of pathologic events following subsidence of hepatitis has not been proved and that certain routine fol low up studies on people who have had hepatitis show no more than the normally expected incidence of cirrhosis Physicians who take care of large numbers of liver pa tients however are likely to gain the clinical impression that in some cases classic cirrhosis is a sequel to something that happens in the liver during and following viral hepatitis It is of course a fruitless pastime to argue about the possible sequels of World War II hepatitis until much more time has elapsed for a cirrhotic liver is usually the result of a decade or two of progressive change Cer tainly at the present moment no data on the matter except those gained from histo pathologic study are worth arguing over Meanwhile however faith in the clinical im pression must suppress the attitude that until a technic has been devised to prove a clini cal observation the observation must be considered wrong

PRIMARY CLINICAL MANIFESTATIONS

Cirrhosis may remain entirely latent for a long period and it is not uncommon to dis cover quite unexpectedly at laparotomy for some unrelated problem that the liver is severely cirrhotic As pointed out above the procedure of percutaneous liver biopsy has taught that at times the anatomic changes have progressed to their final stages before the patient begins to feel sick When he does get sick there is almost always something to be found on physical examination even though it be only a spider angioma or mild hepatomegaly (Table 12) Cirrhosis is a dynamic disease and its manifestations are

TABLE 12 MAIN FINDINGS AT TIME OF FIRST EXAMINATION 400 GENERAL HOSPITAL PATIENTS WITH BIOPSY PROOF OF PORTAL CIRRHOSIS

	%
No abnormal physical findings	2
Hepatomegaly	74**
Esophageal varices	70
Spider angiomas	57*
History of hemorrhage	37
Splenomegaly	33**
Ascites	26
Hemorrhoids	12
Distended abdominal veins	11
Jaundice	10
Pruritic dermatitis	4

* 8% of the 400 patients were Negroes who uncommonly show spider angiomas

** The presence of ascites may obscure these findings

constantly changing For this reason the incidence of various complaints and physical findings can be of diagnostic help only if they describe the clinical situation at the time the patient first seeks medical help

The initial symptoms are most variable Only occasionally do they point directly to the liver and ordinarily they develop so slowly that the patient cannot specify a date of onset Anorexia loss of weight and strength general lassitude nausea and in creasing girth are common first complaints These are not to be considered prodromal symptoms for a good part of the subjective course is characterized merely by fluctuating progression of the initial symptoms Some times scleral icterus is pointed out as a surprise to the patient who feels well or the first the patient may know of his disease is the appearance of some complication such as sudden hematemesis

Abdominal pain and bowel disturbances rather regularly plague the patient The pain is not that of abdominal distention and usually the only complaints the patient has about his ascites are its weight and the prob lem involved in the fit of his clothing Rather the pain consists largely of small bowel cramps plus deep steady aching in the liver region The former is common at nighttime

ner of reacting to noxious influences not by the nature of the noxious influence itself The cause for an individual patient s cirrhosis is difficult to determine because no imprint of the specific etiologic activity is left on the liver s altered anatomy Portal cirrhosis can result from the organ s reaction to many types of unfavorable situation Study of etiology reduces itself merely to identification of those situations against which the liver rather than the brain or uterus or some other type of tissue is likely to react the most In spite of the many injurious agents and influences which are known to exist in from 10 to 15 per cent of cirrhotic patients nothing can be found to suggest an etiologic circumstance

There is too much clinical information to permit doubt about the importance of chronic alcoholism as the main stimulus for cirrhosis in this and many other countries It is not possible to specify just what it is about living a life of chronic alcoholism which causes cirrhosis to develop—the alcohol itself adulterants in it the undernutrition or malnutrition of the alcoholic life or possibly some more basic influence which is the cause for both the alcoholism and the cirrhosis But the association is obvious even when one takes fully into account the fact that some people greatly exaggerate their tales of alcoholic intake and others conceal it From series to series in this country chronic alcoholics make up from 60 to 90 per cent of patients with cirrhosis (Table 11)

When cirrhosis is considered as a world wide problem probably nutritional diseases unassociated with alcoholism Manson s schistosomiasis and schistosomiasis japonica are the main etiologic influences The degree and quality of malnutrition as opposed to under nutrition are very difficult to measure but *there is not* the slightest question of some basic etiologic association here Many investigators believe that it is his malnutrition problem *alone* which makes the chronic alcoholic susceptible to cirrhosis It is probable that long periods of dietary inadequacy are required to produce clinical evidence of

TABLE 11 400 CASES OF BIOPSY PROVED PORTAL CIRRHOSIS ENCOUNTERED IN WASHINGTON D C APPARENT ETIOLOGIC CIRCUMSTANCES

	%
Chronic alcoholism	66
History of viral hepatitis alone	15
Alcoholism and viral hepatitis	1
Hepatitis following yellow fever vaccine	1
Hemochromatosis	2
Schistosomiasis alone	1
Schistosomiasis and alcoholism	0 3
Long incarceration as POW	1
History of solvent poisoning	1
None discovered	12

hepatic injury Periods of extreme under nutrition such as those suffered for a few years by previously healthy prisoners of war do not seem especially conducive to the production of cirrhosis The evidence regarding schistosomiasis and clonorchiasis as precursors of cirrhosis is excellent and that for brucellosis is good Syphilis with the history of arsenical treatment appears prominently—to a proportion as great as 20 per cent—in some of the older listings of cirrhosis etiology Today a small number of patients give an impressive history of illness following poisoning or the use of certain medications which are known to be capable of producing focal hepatic necrosis The common toxic agents which are important in this connection are carbon tetrachloride chloroform mushrooms cinchophen phosphorus methyl testosterone and arsenicals Others particularly chlorpromazine cannot yet be evaluated for their potential chronic sequels Even in the case of the better known hepatotoxins when it comes to the individual patient one can seldom do better than wonder about an etiologic connection between the acute episode of poisoning and initiation of the long course of events which lead to cirrhosis

The possible role of viral hepatitis as an incitant for classic portal cirrhosis requires special comment because of its tremendous theoretical and practical implications As the great hepatitis epidemics of World War II fade further and further into the past it is discovered that the proportion of cirrhotics

anatomic relationship This is especially true of palmar erythema which often begins as scattered rather discrete hyperemic areas deep in the skin of the thenar and hypothenar areas Histologically these punctate lesions are found to have some of the characteristics of arteriovenous shunts Gradually the skin over the palmar eminences becomes diffusely and more superficially hyperemic producing eventually the liver palms of classical teaching Paper money" skin refers to an appearance assumed by scattered areas which is similar to that created by the tiny red and blue threads which are processed into this country s paper money It is frequently found in cirrhotics and is of interest especially because it is the only one of the cutaneous manifestations which occurs in the esophageal mucosa Venous stars are short fat branched venous segments which lie just under the skin elevating it slightly They most often are found on the back of the chest It is very difficult to measure the venous pres sure within them but one supposes that at least some are connected indirectly with the hypertensive portal system through the intercostal veins

Changes in the fingernails commonly de velop as cirrhosis progresses For the most part they take the form of increased opacity of the nailbeds The lunulae extend outward as white flame shaped patches reaching at times the tips of the nails In addition the nails are sometimes flattened or curved Clubbing eventually develops in approximately 5 per cent of the cases Toenail changes are much less common

Hepatomegaly has developed in about three quarters of cirrhotic patients by the time they begin to feel sick In most it is of mild or moderate degree There is a misconception that the cirrhotic liver is or dinarily a shrunken liver but it becomes small only in some cases either late in the course when fibrosis is far in excess of lobular regeneration or when acute atrophy super venes Differentiation between enlargement of the left lobe and splenomegaly is not al ways easy and even when there is no apparent tenseness of the abdominal wall it is helpful in questionable cases to examine the abdomen while the patient lies in a bath tub of warm water Splenomegaly which is found in about one third of the patients prob ably represents more than passive venous engorgement It is usually harder than the enlarged spleen of heart failure and sple nomegaly of the patient with cirrhosis shows poor correlation with the other signs of portal hypertension

Abnormal fluid retention leads to fluctuat ing symptoms and signs which at times come to dominate the clinical picture Edema some times spreads rapidly but anasarca is rare until the final stages of the disease The pres ence of ascites which is discussed in another chapter does not correlate well with the severity of the liver disease or the general state of the patient s response to treatment and one can only assume that control of aldosterone activity is not directly related to the major processes which are going on in the cirrhotic patient When ascites is progressive certain secondary pressure symptoms may develop Edema of the legs which oc curs in about half of the patients is in part secondary to increase in caval pressure Dyspnea due to pressure against the dia phragms can be the most distressing of all symptoms and this is the main indication for draining off ascitic fluid Hydrothorax which eventually develops in approximately 10 per cent of cases may add to the patient s problem Fluid seldom collects here in large volume and clinical differentiation of it from the ascitic mass is usually difficult Fluid from the pleural cavity like that from the abdomen may be bloody

Hemorrhoids are very disappointing as a sign of the portal hypertension of cirrhosis Because the inferior mesenteric vein begins as the superior hemorrhoidal vein hemor rhoids theoretically should frequently be found in cirrhotics but they are not The incidence is only about 10 per cent

A better direct sign of portal hypertension is distention of superficial abdominal wall veins A native portacaval venous shunt is

while the latter is a complaint of active periods Diarrhea is a problem in about a third of the patients It is persistent without any characteristic pattern About as often patients are chronically constipated Alternating *diarrhea and constipation* is not uncommon

At the time of the first examination jaundice is not often found An incidence of about 10 per cent can be expected but because this is a sign which is likely to fluctuate it is common for jaundice to appear as time goes on Edematous tissues do not show jaundice with the same intensity as do those with normal fluid content and bizarre appearances are sometimes produced Thus unilateral jaundice may be found in a patient who has had a stroke which has left one side of his body edematous Although pruritis is far more common in cases of obstructive jaundice it is occasionally encountered in the patient with portal cirrhosis There is a direct correlation with the intensity of the jaundice in most cases

Spider angiomas (nevi araneosi) serve in diagnostic importance far beyond their insignificant appearance by frequently providing a hint of cirrhosis and varices when no other stigmas are to be found They are encountered in approximately 60 per cent of cirrhotic patients who come to medical attention About two thirds of these patients also have esophageal varices while only about one third of cirrhotics who have no spider angiomas have varices It is important to note that the lesions do not always signify cirrhosis Commonly small numbers appear during the course of pregnancy in normal *women* Occasionally small ones can be found during the active phase of viral hepatitis and people who are entirely normal may rarely be found to have a few

The implications of spider angiomas are the same whether they are hard to find or blatant in size and numbers *Sometimes* only one can be found perhaps in a bald spot on the top of the head and at other times the whole side of a patient s face may be disfigured by a huge lesion which is elevated a centimeter or more They are notoriously difficult to demonstrate in Negroes Following serious bleeding they tend to fade out temporarily thus introducing a potential diagnostic error in the evaluation of the patient who presents *himself* as a problem of emergency hemorrhage Successful surgical portal decompression does not notably affect the number or appearance of spider angiomas One of their most interesting clinical features however is their ability to appear and disappear apparently spontaneously almost overnight even though most remain quite static in location and size Another special characteristic is that in approximately 98 per cent of patients the distribution of spider angiomas is limited to the upper half of the body When they can be found below the level of the umbilicus the number is always small This applies in both liver disease and pregnancy

The characteristic appearance of a spider angioma is best understood by examining its histopathology It is a cutaneous arteriovenous shunt type of structure with quasi glomus characteristics The central portion is composed of a few arterioles which course *upward almost to the surface side by side* They empty directly into venules which spread out close to the skin s surface in a radial fashion Skin temperature over the lesion is from 1 to 3 C higher than that of the surrounding skin In order to diagnose a spider angioma arterial pulsation and central filling must be demonstrated The lesion can thus be differentiated from simple cutaneous telangiectasis cherry angioma the hyperemia of tiny scars and similar unrelated venous lesions In spite of endless speculations and arguments the cause of spider angiomas remains obscure There are those who believe the clinical facts suggest that an excess of circulating estrogens is the explanation while others point to the distribution peculiarity *as proof of an anatomic* basis

There are other common vascular skin abnormalities in cirrhosis These do not have the same diagnostic significance as do spider angiomas although they may bear some

anatomic relationship This is especially true of palmar erythema which often begins as scattered rather discrete hyperemic areas deep in the skin of the thenar and hypothenar areas Histologically these punctate lesions are found to have some of the characteristics of arteriovenous shunts Gradually the skin over the palmar eminences becomes diffusely and more superficially hyperemic producing eventually the liver palms of classical teaching Paper money skin refers to an appearance assumed by scattered areas which is similar to that created by the tiny red and blue threads which are processed into this country s paper money It is frequently found in cirrhotics and is of interest especially because it is the only one of the cutaneous manifestations which occurs in the esophageal mucosa Venous stars are short fat branched venous segments which lie just under the skin elevating it slightly They most often are found on the back of the chest It is very difficult to measure the venous pres sure within them but one supposes that at least some are connected indirectly with the hypertensive portal system through the intercostal veins

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effected via the veins of the falciform ligament to the anterior abdominal wall where connections are made through the paraumbilical veins of Sappey and the superficial abdominal veins to the epigastric veins and finally the caval system Increased portal pressure may cause the superficial veins to stand out prominently upon inspection and palpation especially over the lower lateral aspects of the abdominal wall They can be studied well by *infra red photography* The well popularized caput medusae of elevated radiating periumbilical veins is a very unusual finding Blood flow in the distended veins is of course in the caudad direction When blood flows upwards in prominent abdominal veins the cause is inferior venal caval obstruction with normal portal outflow

Due to the diseased liver's difficulty in catabolizing circulating estrogen cirrhotic males may develop certain feminine stigmas Possibly these have been emphasized in the classic literature more than their true incidence justifies Loss of body hair is frequently mentioned but the fact is that many severe cirrhotics are very hairy and many of the rest never had much body hair to begin with Rarely alopecia universalis develops as cirrhosis progresses but this has quite a different explanation Occasionally the testicles are found to be abnormally small and soft Histopathologically there may be some atrophy of the germinal epithelium and thickening of the seminiferous tubular lamina propria The prostate sometimes shows a degree of metaplasia Impotence is a common complaint in these cases True gynecomastia is distinctly uncommon It may be accompanied by tenderness a colostrum like secretion and enlargement of the nipples and areolae all of which are potentially reversible Strangely gynecomastia may affect only one breast The Silvestrini Corda syndrome is portal cirrhosis in the male with especially promient acquired feminine physical characteristics The only significant effect of excess feminizing influence on the woman is endometrial hyperplasia with menorrhagia

Eventually the patient with cirrhosis who survives long enough develops a body configuration and general appearance which are quite typical of the condition (Fig 182) Although there are many very fat cirrhotics wasting with loss of fat and atrophy of muscle are much more common This is particularly true in the chronic alcoholic The muscle wasting is most striking in the temporal and shoulder muscles and the *sunken templed thin shouldered* appearance may suggest the diagnosis when the patient is first seen If ascites is present dependent abdominal protuberance and relatively narrow subcostal girth contribute to the typical cirrhotic appearance A very common abdominal sign of cirrhosis is marked increase of the distance from xiphoid process to umbilicus over the distance from umbilicus to pubis Normally the two distances are equal

LIVER FUNCTION TESTS

The most important thing to understand about tests for liver function in portal cirrhosis is that in some patients and at certain stages they are all normal Furthermore they are not at all useful for making the diagnosis of cirrhosis Cirrhosis is a disease marked by perilobular fibrosis and certain parenchymal alterations The former does not directly influence the state of hepatic physiology *Parenchymal changes do* and because they are primarily dynamic processes the liver function tests give important information about the state of cirrhosis activity *It is this ability to bring to light* quantitatively some of the physiologic results of pathologic alterations that makes the tests useful in cirrhosis The tests which give the best information about the progress *of active* parenchymal injury are measurements of the prothrombin time esterified cholesterol blood urea nitrogen thymol turbidity cephalin cholesterol flocculation and circulating bilirubin After the disease has become compensated or quiescent the degree of malfunction is best evaluated by measurement of bromsul

falein retention and of serum albumin and serum globulin concentration

HISTOPATHOLOGIC ASPECTS

During the course of cirrhosis the liver passes through a continuous series of histopathologic changes Examination of serial specimens taken by liver biopsy shows that four main histopathologic processes are concerned hepatic cell necrosis nodular regeneration connective tissue proliferation and architectural distortion These as histologic features show a relationship to each other throughout the progression of the disease There is however no correlation between the amount of fibrosis and the clinical manifestations although this is partly offset by the closeness with which the clinical course parallels the parenchymal changes

Clinical and experimental observations prove that the fatty liver can become cirrhotic and that it is the first stage in a sizable portion of clinical cases (Fig 183) Fatty metamorphosis is a reversible process however and it is during this stage that prophylactic therapy should theoretically do most good Unfortunately in actual practice it is found that successful removel of fat does not necessarily arrest the progression of nutritional cirrhosis although it is believed to help Fatty metamorphosis is a process which may remain static for a long time in some cases Clinically at this stage the patient is usually well but occasionally he

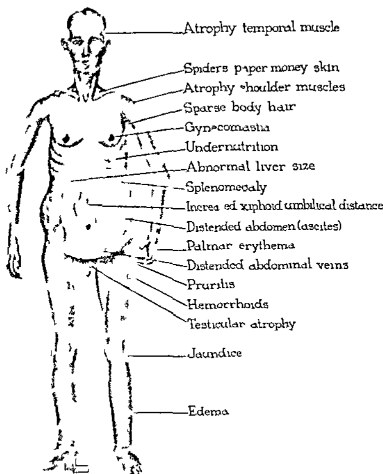


FIG 182 Typical physical appearance and main physical abnormalities of advanced portal cirrhosis

demonstrates manifestations which are usually expected only in full blown cirrhosis These include liver failure portal hypertension and esophageal varices Rarely spiders and ascites develop

The stimulus for progression to fibrosis which is an irreversible process is hepatic cellular necrosis The degree of initial necrosis governs the eventual thickness of the fully developed fibrous septa Because the vascular distribution in and around the lobules appears to have a lot to do with determining the location of maximum necrosis it also influences the pattern of the fibrous septa as they are laid down The septa may later be shifted a little by the pressure of regenerating lobules as repair progresses but they nevertheless have primary control over distribution of regenerating activities Although fibrosis seems to have about the same general pathologic significance however it is arranged it helps for clinical thinking to divide precirrhosis and cirrhosis into three specific groups according to the architectural distribution of fiber *Portal fibrosis* is characterized by fibrous deposits in the portal areas without subdivision of or complete encompassment of the liver lobules It is not cirrhosis By definition *portal cirrhosis* cannot be diagnosed unless the fibrous septa join each other to produce such subdivision and encompassment

Postnecrotic or *coarse nodular cirrhosis* the third type has had a stormy history at the hands of the hepatologists with alternating acceptance and rejection as a valid variant in portal-cirrhosis progression It is an end stage in cirrhosis characterized by the presence of very broad fibrous septa which are widely separated by large regenerating nodules The coarse nodular pattern is apparent over the liver s surface and on its cut section and in addition the configuration of the whole liver may be greatly deformed The nodules which may measure a centimeter or more in diameter represent composite regenerating lobules separated by thin fibrous bands reticular connective tissue and small bile ducts The liver cells themselves are fairly normal Postnecrotic cirrhosis represents the healing phase of unusually severe necrosis with especially prominent regenerative efforts The basis for the necrosis is usually acute toxic hepatitis or very severe viral hepatitis but postnecrotic hepatitis is a rare sequel in either case except when viral hepatitis is of the cholangiolitic type Although the clinical features of most cases of post

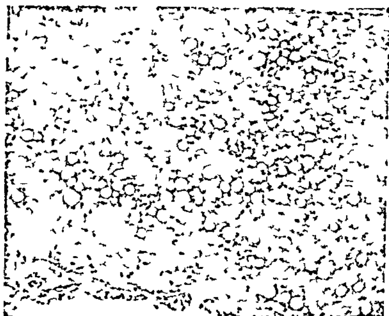


FIG 183 Fatty metamorphosis of the liver Biopsy specimen

necrotic cirrhosis are entirely similar to those of portal cirrhosis it is important to note that liver function tests in the former group show a much greater obstructive tendency particularly as it is reflected in retention of circulating cholesterol and alkaline phos phatase

Precise objective diagnosis of cirrhosis is possible only by histopathologic examination since by definition it is a pathologic condi tion of the liver not a clinical syndrome It must be remembered of course that even though cirrhosis is a diffuse process the specimen obtained by liver biopsy is endowed with all the diagnostic frailties of any sam pling technic Biopsy is especially unreliable for specific diagnosis of postnecrotic cirrhosis because coarseness of the architecture may cause the needle to miss fibrous tissue en tirely It is not unusual to find that the diag nosis of portal cirrhosis is indicated by the first biopsy specimen but that it must be changed to postnecrotic cirrhosis upon re peat biopsy



Fig 184 Surface appearance of liver in fatal case of advanced portal cirrhosis

FAR REMOVED CLINICAL MANIFESTATIONS

One cannot care for cirrhotic patients long without becoming impressed by the fre quency with which abnormal processes or outright diseases quite apart from the liver problem and its complications occur In some instances there appears to be a common etiologic factor and in others the best that one can say is that there is increased incidence among patients with cirrhosis Associated processes which have bleeding potentialities are particularly important as they may ag gravate the diagnostic problem for cirrhotic patients who hemorrhage

Duodenal ulcer is clearly a little more common among patients with cirrhosis than among those without Gastric ulcer may be but here the evidence is not so impressive Whether existence of cirrhosis encourages ulcer bleeding is hard to say but once bleed ing starts hemostatic deficiencies secondary to the liver disease seem to be important in prolonging it Actual exsanguination is not as much of a threat to the cirrhotic patient as is induction of irreversible liver failure

The patient with cirrhosis is particularly susceptible to acute erosive gastritis the re sult being development of myriads of tiny bleeding erosions over the entire gastric mucosa The explanation is sudden necrosis through the neck layer of the mucosa caus ing exfoliation of the more superficial layer It is possible that the necrosis is explained by the hypoxia of mucosal plethora induced by the portal system s venous hypertension

but certain gastroscopic and biopsy observations suggest that the plethora is taken up in the submucosal veins without being reflected back into the mucosa Whatever the mechanism this is a common source of hemorrhage among cirrhotic patients It may develop very quickly and because the mucosa may repair itself within a few hours the diagnosis can be made only by gastroscopic examination during hemorrhage Ice water lavage usually stops hemorrhage due to erosive gastritis but in rare instances emergency total gastrectomy has been considered necessary to save life

Although the incidence of arterial hypertension appears to be lower in cirrhotics than it is in a comparable segment of the population as a whole anatomic renal disease is much more common The reason is unknown Kidneys removed at autopsy from patients with cirrhosis show some degree of tubular degeneration sometimes with atrophic tubular changes and dilatation In addition there may be hyaline degeneration within the glomeruli and fibrosis through the periglomerular tissue Tubular changes tend to be most severe when there has been jaundice for a prolonged period prior to death The main clinical manifestation of these rather occult renal abnormalities is periodic albuminuria It is to be noted that cirrhotics are unusually susceptible to common acute glomerulonephritis perhaps because of decreased resistance to secondary bacterial activity At autopsy acute or chronic glomerulonephritis is encountered in from 5 to 10 per cent of cirrhotic patients

Because of the disturbances in glucose metabolism which are occasioned by diffuse liver disease the question of concomitant diabetes mellitus frequently arises For the most part this concerns interpretation of the glucose tolerance test in the patient whose liver is suspected to be physiologically unable to exhibit its normal rate of glycogen storage Such a liver is responsible for prolonged elevation of blood sugar following an ordinarly meal or a dose of glucose But there is no more diabetes among patients with portal cirrhosis than among comparable noncirrhotic people In the cirrhosis of hemochromatosis of course the situation is quite different When diabetes occurs with coarse nodular cirrhosis there is usually skin pigmentation too and this combination is designated the Hanot Chauffard syndrome

The relationship of chronic ulcerative colitis to liver disease is a complicated one as has already been discussed The liver probably always suffers to some degree via portal drainage when the colon is chronically inflamed Autopsy and liver biopsy studies suggest that there is an increased incidence of cirrhosis among patients who have ulcerative colitis The reverse does not appear to be true

In spite of the common observation that elevation of the circulating bilirubin level has a salutory effect on the clinical manifestations of rheumatoid arthritis symptomatic joint disease is common in cirrhosis To be sure this is usually osteoarthritis but occasionally rheumatoid arthritis develops during the course of cirrhosis even when there is jaundice

Gallbladder disease and gallstones do not favor development of portal cirrhosis as opposed to their etiologic role in biliary cirrhosis Their incidence in portal cirrhosis is the same as that in people without cirrhosis

Cirrhosis is sometimes accompanied by macrocytic anemia Although it is usually mild there is a constant reticulocytosis of 10 per cent or more in about half such patients The difficulty of excluding slow unrecognized bleeding into the gastrointestinal tract dynamic hypersplenism and malnutrition effects is obvious but in some cases the explanation for reticulocytosis appears to be acquired hemolytic anemia In many patients the erythrocyte survival time is decreased Even though classic listings of causes of hemolytic anemia always include liver disease the mechanisms are not clear Splenectomy does not appear to help this form of hemolytic anemia As for the effects rather than the causes hemosiderosis of the liver is an easily understood complication

of hemolytic anemia Mosse s syndrome or cirrhosis with polycythemia is discussed elsewhere

COMPLICATIONS

The chief complications of cirrhosis are liver failure variceal hemorrhage and primary carcinoma of the liver These are discussed separately Hematologic and hemostatic deficiencies secondary to hypersplenism are next in importance There are many hematologic unknowns in this disease Thrombocytopenia hypoprothrombinemia and thrombopenia are serious threats to the cirrhotic patient both during his general course and during surgical therapy of portal hypertension In assaying the plasma prothrombin it is particularly important to note that the two stage technic may demonstrate considerable reduction when the one stage prothrombin time is normal

Both leukopenia secondary to hypersplenism and something called decreased resistance make the patient particularly susceptible to secondary infection Pulmonary renal and skin infections are most common No doubt interference with pulmonary expansion caused by ascites and hydrothorax if there be any is important in this regard Occasionally septicemia due to colon organisms occurs Detection of a suspected infectious process may be very difficult The main problem is that fever in the absence of infection and without hepatic decompensation is common in cirrhosis and sometimes it reaches high levels When fever is merely part of the picture of uncomplicated cirrhosis the curve is usually of only moderate elevation and shows a rather steady course Nevertheless one may find it impossible to exclude hidden infection This type of fever in the cirrhotic fails to respond to antimicrobial therapy and its identification may have to await response to blind treatment

The malnutrition of cirrhosis is accompanied by a variety of physical abnormalities There is none peculiar to cirrhosis Glossitis and cheilitis are common The usual skin lesions are hyperkeratosis and hyperpigmentation Bilateral painless parotid swelling which is sometimes encountered appears to be a manifestation of malnutrition caused by changes in secretory activity

The increased cardiac output of the cirrhotic patient the great isotonic expansion of extracellular fluid the hypervolemia and the common autopsy finding of brown atrophy of the myocardium—all might suggest that cardiac decompensation should be a common problem in cirrhosis This is not so It may occur however and the greatest clinical skill is required to disentangle certain manifestations of heart failure from those of the cirrhosis itself

Two other complications which tax clinical acumen are acute liver pain and superimposition of acute viral hepatitis Occasionally the patient with cirrhosis develops acute frightening pain in the right upper part of the abdomen This has in the past often led to surgical exploration with the expectation that a perforated ulcer or ruptured gallbladder would be found for all subjective and objective manifestations including leukocytosis fever abdominal spasm and collapse point to an acute catastrophe As the phenomenon has become better known and as reports have appeared telling of cirrhosis as the only operative finding a more critical attitude has developed There is no explanation for the pain it is not due to sudden enlargement of the liver although that may be accompanied by considerable pain nor is it due to development of perihepatitis The clinical dilemma is a serious one because operation carries with it the danger of inducing hepatic decompensation Perhaps most diagnostic help comes merely from realization that this phenomenon can occur Needle aspiration of the peritoneal cavity and roentgenologic study to demonstrate free air or the signs of early ileus may help the clinician feel more secure

Because the cirrhotic patient is especially susceptible to gastrointestinal hemorrhage he is likely to receive more blood transfusions than most sick people He runs a special risk of developing homologous serum hepatitis

Accidental superimposition of acute hepatitis upon a chronically damaged liver is a particularly tragic happening Survival is not likely The problem of differentiating this course of events from the much more common complication of spontaneous liver decompensation often is impossible even at autopsy Clinical suspicion may be strong and sometimes the pathologist is willing to render an opinion from a liver biopsy Treatment is the same in either case

The mechanical complications of umbilical and inguinal herniation are secondary effects of abdominal distention and stretching The incidence of each is about 10 per cent when ascites is present As a further complication of umbilical hernia it sometimes happens that its thinned skin ruptures either spontaneously or through irritation of a tight binder

PROGNOSIS

For the majority of patients with portal cirrhosis the prognosis at the time of diagnosis is worse than it is for the majority of patients with visceral cancer Approximately one third of cirrhotics who are sick enough to seek hospitalization die within the first year of observation Only about one third are still alive at the end of five years The 1940 Census Bureau figures showed that the annual mortality rate for cirrhosis per 100 000 population was 8 6 The urban rate was twice as high as the rural

The causes of death have already been discussed Liver failure is the big problem with or without precipitating hemorrhage With the introduction of safe and effective technics for control of acute variceal hemorrhage and for definitive portal decompression the danger of simple exsanguination has been reduced considerably (Table 13) but because even quickly controlled hemorrhage frequently leads to liver failure the over all picture has not brightened very much Regularly the cirrhotic patient s first hemorrhage is his most serious one (Table 14) so that if his survival period is to be increased appreciably his varices must be found and eliminated before they have had the chance to bleed at all

As has been emphasized throughout the discussion cirrhosis is a most variable disease In some patients it does not interfere with normal life nor does it shorten expected longevity Quite naturally the manifestations which permit one to predict a poor prognosis are those which indicate hepatic incompetence —jaundice ascites marked hypoalbuminemia and major defects in the hemostatic mechanism Persistent jaundice gives the best information in this regard being evidence of decompensated parenchymatous degeneration About one third of cirrhotic patients with jaundice who are treated under the best hospital conditions die before the jaundice clears The shortened life span of the jaundiced cirrhotic is best indicated from the common

TABLE 13 CAUSES OF DEATH AMONG CIRRHOTICS IN A GENERAL HOSPITAL (100 PATIENTS)

	No of Patients
Liver failure precipitated by hemorrhage	38
Liver failure in the absence of hemorrhage	29
Exsanguination from varices or erosive gastritis	15
Metastatic hepatoma	3
Diseases unrelated to cirrhosis	
Cardiac infarction or decompensation	6
Hemorrhage from duodenal ulcer	2
Pneumonia or atelectasis	2
Mesenteric thrombosis	1
Leukemia	1
Abdominal abscess after colectomy	1
Carcinoma of pancreas	1
Miliary tuberculosis	1

TABLE 14 45 CIRRHOTIC PATIENTS WHO DIED AS A RESULT OF HEMORRHAGE FROM VARICES OR EROSIVE GASTRITIS RELATION TO CHRONOLOGY OF SUCCESSIVE HEMORRHAGES

	No of Patients
Died during 1st hemorrhage	29
Died during 2nd hemorrhage	13
Died during 3rd hemorrhage	1
Died during 5th hemorrhage	2

observation that about 85 per cent die within a year of their first examination About 70 per cent of all cirrhotics who come to autopsy including those who die suddenly from ex sanguination or from unrelated disease are jaundiced

TREATMENT

One often hears it said that medical treat ment of the patient with cirrhosis engenders more insecurity in the doctor than does treatment of most diseases because the most vigorous treatment seems so unsubstantial It is certainly true that diet and vitamins and rest do not add up to a particularly spectacular form of therapy but one may take heart from the simple observation that sometimes spectacular clinical results are achieved Information obtained from clinical examination liver function tests and biopsied liver specimens shows that it is worth treat ing the cirrhotic patient At times study of liver biopsies during simple medical treat ment indicates that great regenerative ac tivity and disappearance of degenerative and necrotic changes have been accomplished The degree of clinical improvement in an occasional patient is truly amazing Para doxically lobular regeneration which is one aim of treatment must necessarily increase the severity of portal hypertension and at times of esophageal varices

There are five principles of cirrhosis treat ment The first and most pressing is constant guard against and active prophylaxis for the complications as discussed above and in the chapter on portal hypertension

The second is prophylaxis against further liver damage through control of alcoholism or eradication of toxic substances from the patient s environment Data from clinics the world over have proved that abstinence from alcohol is a sensible feature of any program for treatment of cirrhosis There is how ever no practical answer to the problem of chronic alcoholism As if to demonstrate that the secrets of Nature are sometimes not solved best through rational thinking and planning it is often found that when the patient is cured of his chronic alcoholism he only substitutes some other habit which results in greater harm to society

Third if there is ascites or edema efforts must be made to correct the tendency to wards salt and water retention without in ducing the low salt syndrome through over zealous treatment Mercurial diuretics and a diet containing only 500 mg of salt are helpful in most cases Such a disagreeable diet however interferes to an important degree with nutritional efforts and for this dilemma of palatability salt substitutes are a rather unsatisfactory solution Quick re turn of ascitic fluid following paracentesis is a special warning to abandon severe sodium restriction because of the danger of the low salt syndrome The potential danger of using ammonium salts for diuresis has been men tioned

The final two principles have to do with promoting hepatic lobular regeneration and improving general nutrition These are best accomplished if salt problems do not neces sitate restrictions by having the patient eat an adequate amount of what in the hospital and most home circles is known as a normal diet The history of professional faddism in diets for liver patients is a rather depressing one Most all dietary elements have in turn been first popularized as especially beneficial and then in turn been condemned as po tentially dangerous The patient has certain optimum caloric requirements vitamin re quirements protein requirements etc and no combination of foods has ever been de vised which so satisfactorily meets all as does the normal diet In addition the normal diet is more acceptable to more patients than other diets and none is useful if the patient does not eat it It is rather unrealistic to suppose that a patient will eat a dis agreeable diet because he is told it is good for him It is more important to check what the tray contains when it leaves the patient than what it contained when it was passed to him

When the patient is too sick to meet a basic caloric requirement of about 2800

calories daily in the usual fashion the poor *substitutes of transoral tube or parenteral* feedings must be used In spite of what the calculations of the vital economists seem *to show one can be sure that food put into* the stomach through a tube will not prove as useful to the patient s metabolism as food which he can see smell chew and swallow But tube and intravenous feedings are on occasion life saving Carbohydrate protein products and fat can be given by both methods Time and volume limitations of the intravenous route make it most practicable to concentrate on glucose calories

Vitamin and electrolyte requirements must of course be met an easy enough matter There is good reason to believe that vitamin *requirements are higher and vitamin utiliza* tion poorer in the cirrhotic patient whatever the stage of his disease than in the healthy person Vitamin supplementation over a long period is desirable Multivitamin capsules brewers yeast crude liver and parenteral concentrates are popular

The practical usefulness of increasing the intake of the dietary lipotropic substances choline and methionine is a disputed matter There is clear cut evidence that large doses of lipotropic agents can reverse the earliest stage of precirrhosis fatty infiltration in *experimental animals The clinical evidence* seems to indicate that amounts in excess of that contained in the normal diet do not serve any useful purpose in man

Potassium supplementation is an essential matter in an occasional cirrhotic patient Potassium metabolism is frequently altered in cirrhosis tending to lead to intracellular deficiency and synthesis of protein is in fluenced in part by availability of intracellular potassium *It is a common observation that* it is impossible to correct potassium de ficiency once liver failure has developed Prophylactic attention to this point is es sential

Although intravenous concentrated serum albumin may furnish brief help for osmotic problems its use carries the danger of in ducing pulmonary edema and of initiating variceal hemorrhage It is an extremely ex pensive way of adding protein to the body Testosterone may have a somewhat beneficial effect on the feminizing manifestations and *on a negative nitrogen balance* and it gives some relief to patients with pruritis but these positive features are outweighed in most instances *by its activity in promoting* salt and water retention Methyl testosterone is a potential hepatotoxin

Steroid hormone therapy has been tried extensively for treatment of various stages of cirrhosis and the results have been very poor In decompensated cirrhosis it is true cortisone may have a remarkably beneficial effect on the appetite and perhaps it is for this reason that the level of serum albumin *rather regularly* rises and the percentage of esterified cholesterol increases There has been some question whether cortisone may cause *fat to disappear from* the liver cells but in the great majority of cases the liver s histologic picture shows no important change during steroid hormone therapy Any clinical or laboratory benefits which may be noted regularly disappear following discontinuation of the hormone and the patient shortly is no further ahead than he was before The special disadvantage of steroid therapy for the cirrhotic patient is water and salt reten *tion with aggravation of a pathophys*iologic problem which demands alleviation In addi tion hemorrhage from esophageal and gastric varices is particularly common during steroid treatment the presence of varices can be considered an absolute contraindication to the use of these agents

Bed rest is generally believed to be a useful measure during periods of hepatic de compensation as signaled by the onset of *jaundice Usually* the patient will be in sympathy with this for a while There is however no concrete reason for thinking that the patient with chronic jaundice is better off when he is forced to stay in bed

In conclusion it seems well to point out that there is nothing very magic available *for the treatment of cirrhosis There is* more vehemence to arguments over the useful

ness of various therapeutic measures than the facts can possibly justify The most difficult of the doctor s responsibilities to his cirrhotic patient is to see to it that he wants treatment and wants to take the responsibility for his own future Because of the chronicity of the disease and the emotional make up of the average cirrhotic patient special effort must be expended to induce him to want to carry out self-controlled treatment for years and years after he is discharged to his own care

CARDIAC CIRRHOSIS

Chronic passive congestion of the liver which is so regularly observed in heart failure sometimes behaves as the precursor of irreversible chronic liver disease The autopsy incidence of cardiac cirrhosis among chronic cardiac patients ranges between 5 and 10 per cent Although the incidence of mild fibrosis is considerably greater it is difficult to know why so often there is no progression beyond the stage of mere congestion even when the patient has severely chronic cardiac decompensation An element of malnutrition may be required before cirrhosis develops but it is usually difficult to evaluate this from the history The liver disease which accompanies chronic constrictive pericarditis (Pick s pseudocirrhosis) is notoriously severe suggesting that the congestion itself is the main etiologic factor

The earliest change in the histologic picture is mere dilatation of the central lobular veins secondary to central venous hypertension Central lobular necrosis may then develop probably due to the hypoxia of stagnation as well as to the pressure itself Slowly fibrosis replaces the areas of necrosis There may be compression of the hepatic cell septa but usually the lobular architecture is not greatly disturbed When the damage is severe the end result may be indistinguishable from the picture of portal cirrhosis The liver shrinks from its fibrosis and at the end it may be remarkably small

All of the complications of portal cirrhosis may develop in cardiac cirrhosis including massive hemorrhage from esophageal varices Of great significance is the fact that portal hypertension with splenomegaly and varices may develop during the stage of simple chronic passive congestion The hemodynamic factors which work to cause portal hypertension under these conditions are probably quite complex Ascites is a frequent complication and whether the basis is largely heart failure or largely hepatic it is especially difficult to control Persistent jaundice at times develops late in the course Subclinical hyperbilirubinemia is common whenever heart failure exists

CRUVEILHIER BAUMGARTEN DISEASE AND SYNDROME

When portal hypertension with splenomegaly and a venous hum indicating a patent umbilical vein is encountered in a patient without histopathologically demonstrable liver lobule disease the diagnosis of congenital Cruveilhier Baumgarten disease can be made The supposition is as it has been for 50 years that the disease is caused by congenital hypoplasia of the intrahepatic portal connections The left member of the paired umbilical veins has remained patent following birth Earlier it and the paired vitelline veins contributed imperfectly to development of the liver sinusoids as that organ became formed The left umbilical vein was responsible for making the expected connection with the right atrium through the ductus venosum circumventing the fetal liver After birth the left umbilical vein could not close because the pressure within the portal system became elevated at the time of obliteration of the ductus arteriosum If this anatomic set up then remains static as the individual grows up the condition manifests itself as Cruveilhier Baumgarten disease The umbilical vein acts as an important portacaval shunt around the venous block formed by the liver

Cruveilhier Baumgarten syndrome is much more common than the disease It is caused by certain acquired diseases which are able to produce portal hypertension splenomegaly and an umbilical collateral circulation

which becomes developed sufficiently to produce a venous hum somewhere between the xiphoid and umbilicus A very complex system of collateral veins is called into play to effect a portacaval shunt through the *falciform ligament* and the paraumbilical veins of Sappey At times its appears that the left umbilical vein may reopen to take *part in the compensatory collateralization* by effecting a direct connection between the left branch of the portal vein and the veins of the abdominal wall The responsible disease is usually portal cirrhosis by the mere chance of frequency but any acquired cause *for portal hypertension might lead to produc*

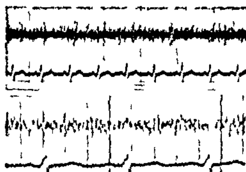


FIG 185 Phonocardiogram over venous hum in case of Cruveilhier Baumgarten syndrome (large bell sensitivity 5 plus) Upper recording at 25 mm sec lower at 75 mm sec

tion of Cruveilhier Baumgarten syndrome There is no question at all that a higher incidence than now suspected would be found if abdominal *auscultation were a more* popular pastime Because the syndrome depends entirely on the mere availability of veins in the falciform ligament for use as a portacaval connection it has no practical significance beyond that of any type of acquired portal hypertension

The unique physical finding which is the *sine qua non* of both the disease and the syndrome is the venous hum It is continuous and may show any degree of intensity (Fig 185) Sometimes it is very loud and coarse It may be heard all the way from xiphoid to umbilicus but ordinarily it is limited to a small area anywhere between It is easily obliterated by the pressure of the stethoscope bell Care is required to avoid more than the most gentle application of the bell during examination Visible veins are not necessarily to be expected and usually there is nothing to be found in addition to the hum to make one suspect the condition The patent veins and their connections are or*dinarily filled during splenoportography and* sometimes injection of a radiopaque medium under pressure into a paraumbilical vein causes *retrograde filling*

Treatment for both the disease and the syndrome must necessarily be directed mainly *towards the esophageal varices which are* always present and which constitute the main threat to the patient Surgical portal decompression is indicated unless there be certain complications as discussed in the next chapter The umbilical collateral channels play an important part in assisting portal *decompression and they should not of course* be disturbed during surgery if this is technically possible

BILIARY CIRRHOSIS

Obstruction of bile flow leads after a while to severe jaundice pruritis enlarged liver elevation of the serum lipids and elevation of the alkaline phosphatase There are two causes for development of this picture *chronic obstruction of the extrahepatic biliary* tract by some obvious cause with production of outspoken secondary biliary cirrhosis *and a primary form (Hanot s cirrhosis)* due to obstruction within the finer biliary radicles The primary form now generally is spoken of as cholangiolitic biliary cirrhosis because the prominent early pathologic hepatic change is inflammatory destruction of the cholangioles It has two clinical variations one *with xanthoma formation and one without* Hanot s name properly belongs only with the latter

Biliary cirrhosis whatever its type is congestive biliary disease and pathologically the liver shows great enlargement bile stasis venous stasis lymph stasis and fibrosis Atrophy may develop as time goes on The

important difference between the pathology of primary and that of secondary biliary cirrhosis is that in the latter the results of ductal obstruction may show prominently Cholangitis pericholangitis and bile duct distention are regularly found In the cholangiolitic type inflammatory infiltration about and injury to the cholangioles is the primary disease process It is likely that the pericholangitis is actually a perilymphangitis The space of Disse the tissue space between the hepatic cells and sinusoids appears to be as the initial lymphatic channel of the liver an important route for spread of infection around the bile ducts Regularly the cirrhosis is associated with active formation of new bile ducts The architecture finally becomes completely distorted through fibrosis lobular fusion and lobular regeneration

Treatment of biliary cirrhosis is often a discouraging matter The liver damage is not reversible although lobular regeneration can probably help make up for hepatocellular necrosis If there be a lesion obstructing the extrahepatic bile ducts this of course must be surgically removed or a biliary shunt must be created by whatever means the anatomic situation permits The medical principles which apply to the treatment of portal cirrhosis apply here Cortisone therapy results in reduction in the levels of the serum lipids and the alkaline phosphatase but it produces no permanent improvement

SECONDARY BILIARY CIRRHOSIS

The causes of secondary biliary cirrhosis are well known gallstone impacted in common duct stricture of the duct congenital obstruction pancreatic carcinoma ampullary carcinoma common duct carcinoma etc The clinical pictures produced by these obstructing lesions are discussed elsewhere The important point is that while the overt clinical problem is being created within the ducts more permanent injury is going on quietly up in the liver Some degree of cholangitis accompanies the obstruction and prominence of the cholangitis manifestations tends to make one focus elsewhere than on the activity of the parenchymal injury itself Adding to the occultness of the parenchymal damage is the fact that the function tests which are designed to measure hepatocellular health remain normal until the disease has progressed for some time The completeness of obstruction as reflected in the degree of jaundice stool color bilirubinemia stool urobilinogen serum alkaline phosphatase and serum lipids may vary considerably from time to time Strangely fluctuation in the degree of obstruction is more likely to develop when the cause is tumor than when it is an impacted stone

CHOLANGIOLITIC BILIARY CIRRHOSIS

Primary or cholangiolitic biliary cirrhosis is quite a different process clinically and pathologically This is largely a disease of women The cause or causes are not known but it is fairly certain that primary is a misnomer here Possibly even such a common disease as viral hepatitis may be the cause in an occasional case Whatever the basis the degree of intrahepatic biliary obstruction remains remarkably static so that spontaneous fluctuations in the severity of the fully developed clinical picture are slow and minor ones The course however is marked by progressive deterioration of hepatic function Most patients die within 5 to 10 years of the clinical onset

The illness ordinarily begins insidiously The patient is likely to be between 30 and 50 years of age when jaundice first appears For a while he may feel quite well in spite of jaundice and pruritis The jaundice which is of the severe obstructive type persists throughout the course varying little once it becomes fully developed The pruritis characteristically becomes the most disagreeable of the subjective manifestations Bile salt medications ordinarily aggravate it and methyl testosterone a potential hepatotoxin gives relief Bradycardia is usually found

In addition to chronic jaundice pruritis hepatomegaly splenomegaly pale stools and dark urine as expected when biliary cirrhosis is of the secondary type there are usually

important problems having to do with portal hypertension and with malnutrition secondary to faulty fat absorption There is frequently rapid weight loss Steatorrhea osteoporosis and skin pigmentation due to excess melanin deposition often develop and at times are the most striking features of the clinical picture There is some evidence to suggest that the pigmentation develops because of pituitary disturbance mediated through the gland's melanotropic hormone It is interesting that the mucous membranes do not become pigmented Most patients eventually show the deficiency type of small bowel pattern upon roentgen examination Important degrees of osteomalacia sometimes develop Severe demineralization may lead to compression fractures of the spine and atrophy of the distal tips of the phalanges Clubbing of the fingers sometimes develops The manifestations of portal hypertension do not differ from those observed in portal cirrhosis and discussed in the next chapter Splenomegaly and esophageal varices often with ascites and spider angiomas may be important clinical features and death from liver failure secondary to hemorrhage is a common terminal event

The main blood chemical changes of cholangiolitic biliary cirrhosis are hyperlipemia accounted for largely by a very high cholesterol level and increased blood lecithin serum which is transparent in spite of the hyperlipemia, hyperbilirubinemia and hyperalkaline phosphatemia Because intrahepatic obstruction is not complete fecal urobilinogen is present and urine urobilinogen is elevated As parenchymal damage progresses the hepatic tests which indicate hepatocellular injury often become strongly positive Hyperbilirubinemia may reflect itself in xanthochromia of the spinal fluid



FIG 186 Skin lesions of the xanthomatous form of cholangiolitic biliary cirrhosis

XANTHOMATOUS BILIARY CIRRHOSIS

The xanthomatous form of cholangiolitic biliary cirrhosis differs from the preceding because xanthomatous skin lesions develop and because malnutrition problems do not appear to be encountered so often Retention of circulating lipids is more marked in both types of cholangiolitic cirrhosis than it is in secondary biliary cirrhosis and particularly so in the xanthomatous form When the total lipids reach a critical level of about 1800 mg per 100 ml skin xanthomas may begin to appear This is always after jaundice has become well established The xanthomas develop first on the hands feet knees and elbows Later the eyelids shoulders and buttocks may become involved and eventually in some cases no area of the skin seems

immune (Fig 186) In general the sites of predilection for xanthomatous lesions are those most susceptible to trauma and sometimes include the points of needle punctures and fresh surgical scars Occasionally xanthomas develop on the corneas In addition to the typical xanthelasma of the eyelids the lesions take the form of both xanthoma planum and xanthoma tuberosum Xanthomas have been reported in the bile ducts thus initially raising some confusion regarding cause and effect but all xanthomatous collections have been proved to be purely secondary to hyperlipemia They are reversible lesions and slow resolution of the characteristic skin elevations usually follows depression of the lipemia below the critical level As they clear they leave patches of atrophic skin

BUDD CHIARI SYNDROME

The Budd Chiari syndrome is that which follows occlusion of the hepatic veins Depending on the suddenness of occlusion the clinical picture may be most variable Thus occlusion is sometimes sudden and complete and at other times gradual and partial An occluded vein may later become recanalized or partial occlusion may suddenly become complete Furthermore because the syndrome is usually merely a complication of some other serious disease process the picture is often complicated by the clinical manifestations of the primary process Men appear a bit more prone to hepatic vein occlusion than women At the time the diagnosis is made the average patient is in the fourth decade of life It has been reported during the second year

Although this is an unusual syndrome a great many causes have been proved and others have been suspected The site of obstruction may be the inferior vena cava at the level of the liver s caval fossa the ostia of the hepatic veins or within the hepatic veins themselves The syndrome has been associated with normal pregnancy No congenital cause has been proved although abnormally extensive obliteration of the fetal ductus venosus system or the venae revehentes has seemed possible Fetal hepatitis and congenital vein strictures have been suggested In the adult proved mechanical causes for hepatic vein occlusion are trauma to the hepatic area prolonged deceleration of transhepatic venous flow due to shock or debilitating disease local fibrosis secondary to constrictive pericarditis and intrahepatic stasis secondary to surgical portal decompression Possibly postural vein torsions and angulations anomalous venous valves and repeated physiologic trauma as from coughing could cause occlusion Sickle cell anemia polycythemia vera and leukemia have been implicated with assurance Cirrhosis is the only diffuse liver disease which is known to be able to cause hepatic vein occlusion but several localized liver processes have been proved abscess hydatid cyst gumma actinomycosis hepatoma and metastatic tumor Quite naturally extension of intravenous disease to the hepatic veins or to their junctions with the inferior vena cava can cause occlusion hepatic endophlebitis vena caval thrombophlebitis simple phlebothrombosis and the generalized vascular diseases In only about 4 per cent of cases of inferior vena caval thrombosis however does the thrombus extend upward past the renal veins to the area of the hepatic veins Neighboring diseases which may cause hepatic vein occlusion are lymphadenopathy diaphragmatic tumors and fibrosis subphrenic abscess diffuse peritonitis and carcinoma of the gallbladder The most common cause of all is extension of a malignant tumor into any of its regional veins with growth along the vein system to the junction of the hepatic veins and the inferior vena cava Hepatoma carcinoma of the pancreas and metastatic tumor to the porta hepatis are most important in this role

Sudden complete occlusion of the hepatic veins may kill within a few days whether this be the first episode or merely an acute episode superimposed upon chronic partial obstruction Back pressure is suddenly exerted directly against the lobular cells because the central lobular veins connect with the hepatic

veins through the valveless sublobular veins A potential portacaval collateral shunt system is available but requires a brief interval to commence functioning The picture includes severe right upper quadrant pain nausea vomiting rapidly developing ascites almost sudden hepatomegaly shock with cyanosis and uncontrollable hypotension liver failure and death

When obstruction progresses slowly the clinical progress is characteristically irregular and unpredictable The course usually lasts no more than a few months *It is very difficult* to recognize temporary occlusion and because the diagnosis of Budd Chiari syndrome which becomes spontaneously cured is one which can rarely be made with confidence, the actual danger to life cannot be determined The first symptom is usually epigastric and right upper quadrant pain Hepatomegaly *portal hypertension* and ascites become prominent early The ascites accumulates quickly At times it is hemorrhagic and it may be accompanied by *hydrothorax* There is usually jaundice The manifestations of portal hypertension are an important part of the picture and death from bleeding esophageal varices may eventuate The usual cause of death is either the primary disease which was responsible for the syndrome or liver failure It is entirely possible for spontaneous recanalization of the hepatic veins to save the patient at least for the time being but chronic Budd Chiari syndrome is not compatible with long survival

In all cases all tests of liver function become grossly abnormal Pathologically the liver shows changes secondary to mechanical back pressure Venous congestion may be localized or generalized depending on the site and extent of hepatic vein occlusion The characteristic microscopic changes are venous engorgement central lobular necrosis and fibrous replacement

There is no direct treatment for Budd Chiari syndrome Anticoagulation therapy is never indicated Efforts at support are likely to be ineffective in altering the course

PRIMARY LIVER TUMORS

A useful way to classify primary liver *tumors is as follows*

- I Liver cell tumors
  - A Adenomas
  - B Carcinomas
- *II Bile duct tumors*
  - *A Adenomas (solid cystadenoma)*
  - B Carcinomas (adenocarcinoma cyst adenocarcinoma carcinoma simplex)
- *III* Mixed liver cell and bile duct carcinomas
- IV Tumors without hepatic elements
  - A Vascular tumors (hemangioma lymph angioma endothelioma)
  - *B Adrenal rest tumors*
  - *C Teratomas*
  - *D Melanosarcomas*
  - E Other sarcomas

All of these tumors are uncommon and some such as primary melanosarcoma and the other sarcomas are extremely rare These are tumors of all ages and races Except for hemangiomas all develop more commonly *in the right lobe than the left*

It is difficult to separate simple *adenomas* from *hamartomas* Both are congenital types of aberrations and the resulting lesions have no connection with the bile ducts A hamartoma combines vascular and normal liver elements with wide variations in arrangement and degree of differentiation Both may be multiple and may exhibit malignant potentialities

Hemangiomas are congenital lesions sometimes multiple which grow steadily over the years and may reach large sizes Women are more likely to be affected than men Hemangiomas make their presence known by their bulk ordinarily Rarely there may be spontaneous intraperitoneal hemorrhage The diagnosis is suggested only if auscultation should reveal a venous hum or if roentgen study should show identifiable calcified phleboliths Because hemangiomas remain well localized and because most develop in the left lobe these are the most favorable of liver lesions for surgical extirpation Many cases have been treated this way with excellent results

True primary *malignant tumors of vascular origin* comprise a group about which there is much dispute and their status is difficult to judge Some reported cases appear to have been examples of Kaposi s metastasizing angiosarcoma Several primary endothelial sarcomas of a decade or two ago appear to have been initiated by the radioactivity of thorotrast when that medium was being used to make the liver radiopaque for outlining localized lesions

Hepatoma is far more common in men and cholangioma is a little more common in women In the United States the patient with cirrhosis and especially the one with hemochromatosis is particularly susceptible to liver cancer (Fig 187) As many as 75 per cent of patients are found to have underlying cirrhosis When there is no cirrhosis the tumor is likely to be a cholangioma and the other 25 per cent is partly accounted for by cholangiomas in patients of the precirrhotic



Fig 187 Hepatoma of liver developing in advanced cirrhosis Specimen demonstrates typical necrosis and cystic changes within the tumor

PRIMARY CARCINOMA

Hepatic cell (hepatomas) and bile duct (cholangiomas) carcinomas should be thought of together because of their clinical similarities Sometimes the histologic elements of both are combined (cholangio hepatomas) although then the cholangioma element predominates because it grows faster Primary liver cancers are encountered in about 0 3 per cent of adult autopsies in this country Metastatic liver tumor is at least twenty times as common Hepatoma is encountered about three or four times as frequently as cholangioma except in infants and children in whom the incidence of the two types is about equal

age group In other parts of the world cirrhosis seems even more important in the genesis of hepatoma especially in certain regions of India and China where some reports indicate that half of the cirrhotics die of liver cancer In the Witwatersrand region of South Africa 90 per cent of all cancers encountered at autopsy are primary in the liver This striking regional or possibly racial susceptibility to malignant hepatic change seems related in some ways to unique nutritional problems It is highly improbable that exposure to metazoan infection of the liver has much bearing on regional differences in incidence as has been suggested In this country

there is moderate predilection for the Negroid race Although these are cancers which ordinarily are diagnosed when the patient is in the fifth or sixth decade they have been discovered *in fetuses* and are not unknown in the very aged

The primary tumors are massive and either nodular or diffusely infiltrating Within them the processes of hemorrhage and necrosis frequently cause formation of multiple cystic areas There is a question of whether multicentric intrahepatic origin sometimes occurs an almost inscrutable matter because of the frequency of intrahepatic metastasis First the cancer spreads through its own substance and to the lymph nodes of the porta hepatis Often autopsy shows that it has gone no farther The most common hematogenous metastatic *site is the lung In some cases it may be diffi*cult to decide whether the origin of the tumor is pulmonary or hepatic Splenic metastasis is common Spread through the spine and skull is possible via the vertebral veins of Batson Skeletal metastases are not uncommon but the incidence here cannot be determined at autopsy

Primary liver cancer is difficult to detect early because the majority of patients are already sick with cirrhosis Neither patient nor doctor is likely to consider the possibility of added disease until the clinical course changes considerably Once liver cancer develops the course is characteristically rapid and inexorable to death within six months in 85 per cent of cases Its manifestations are an unusual degree of upper abdominal pain sudden weight loss weakness and new stomach or bowel symptoms Fever is common when the tumor becomes necrotic discovery that a cirrhotic patient is beginning to run a fever with leukocytosis should raise the question of hepatic cancer in addition to the more likely explanation that secondary infection has developed The possibility of cancer becomes better if eosinophilia develops

In many cases of course the presence of the cirrhosis has not previously been recog*nized Then when* cancer develops weakness anorexia quick weight loss jaundice ascites edema hepatomegaly with little liver tenderness and fever are the usual symptoms and signs Rarely some far removed manifestation such as an unprovoked fracture through a long bone metastasis is the first indication of trouble Examination often reveals that chronic signs of cirrhosis such as spider angiomas feminizing changes and increase of the xiphoid umbilical distance over the umbilical pubic distance are present and these supply an important diagnostic tip When the tumor arises in the right lobe the liver almost always retains its usual configuration as it enlarges and it is quite unusual to be able to palpate a distinct tumor until very late in the course if at all If the cancer arises in the left lobe however the enlargement tends to be more localized often simulating splenomegaly *Auscultation* rarely reveals a *friction rub* possibly because of increased intraperitoneal fluid and because the cancer begins deep in the liver tissue

At the end of the course most patients die of liver coma and then it is found that almost all of the liver has been replaced by tumor Esophageal varices are very common and variceal hemorrhage is the second most likely cause of death In addition to the intrahepatic portal obstruction created by cirrhosis and tumor there is frequently wide invasion of the portal venous system by contiguous tumor growth Intravenous extension of tumor into *the hepatic veins to produce the Budd Chiari* syndrome into the inferior vena cava to block the renal veins and up into the chambers of the heart gradually to block blood flow are not rare terminal events An occasional patient dies in hypoglycemic convulsions or of massive intraperitoneal hemorrhage from the tumor surface

By far the best way to establish the diagnosis is by needle biopsy It is not possible in many cases however to judge the most fruitful site for biopsy and if suspicion of cancer runs high it is often necessary to repeat the procedure in different areas before one can be assured he has done what he can to exclude the diagnosis Unfortunately peritoneoscopy does not often furnish help early because the

tumor lies deep within the liver Liver function tests help very little in diagnosis although it is commonly found that the serum alkaline phosphatase activity becomes increased as cirrhosis progresses to hepatoma Occasionally the tumor becomes partly calcified very quickly and then radiologic examination may be helpful for both detection and localization

Treatment is a discouraging matter In a rare case it is possible to carry out surgical extirpation The chances are best if the tumor is restricted to the left lobe X irradiation therapy is not useful nor as yet are any of the oncologic chemotherapeutic agents



Fig 188 Metastatic malignant melanoma of liver

METASTATIC TUMOR

In planning therapy for many tumors it becomes of primary importance to know whether the liver contains metastases To be sure most gastrointestinal and other cancers do not metastasize first to the liver Furthermore no amount of clinical or autopsy study can furnish proof that the liver does not contain metastases Nevertheless if liver metastases which are potentially demonstrable are present it is always important to know about it Unfortunately it is possible to find out by practical clinical means in only a portion of cases Some figures bearing on the relative incidences of various organs as primary sources of hepatic metastases are given in Table 15

Sometimes of course the presence of hepatic metastases in the patient known to have cancer is apparent from the size and configuration of the organ Because direct inspection at operation or at peritoneoscopy permits detection only if the lesions lie on the presenting surfaces these vigorous means for detecting metastasis are not necessarily reliable Percutaneous needle biopsy too is notoriously misleading for demonstration of metastatic tumor it is as though some device of the Devil were directing the needle into the only normal liver tissue in the area

If liver metastases are not palpable the two best means for detecting their presence are simple auscultation and radioactivity scan

Table 15 Metastatic Tumor of the Liver
Location of Primary Site

	W ltl (17) (991 Ca)	W lter R d S (500 C se)	Comb d (1491 Ca e)
Stomach	245	95	23
Bronchus lung	117	81	13
Colon	80	70	10
Esophagus	71	32	7
Biliary system	71	12	6
Breast	66	27	6
Pancreas	52	41	6
Rectum	56	18	5
Cervix	31	15	3
Kidney	28	13	3
Ovary	24	8	2
Melanoma (eye skin)	21	13	2
Uterine corpus	11	12	2
Testicle	11	21	2
Pharynx	18	1	1
Thyroid	12	8	1
Prostate	11	11	1
Others	66	22	6

ning Neither of course has any virtue for positive exclusion of metastases but the former is part of the routine physical examination and the latter can cause the patient no discomfort or hazard If a friction rub is heard over the liver of a patient with known gastrointestinal cancer the diagnosis of liver metastasis becomes rather certain Metastases must reach the liver surface and there can be no appreciable ascites if a rub is to be produced *Although a recent innovation with* problems yet to be solved the technic of radioactivity scanning promises to be a helpful means of detecting and localizing certain



FIG 189 Umbilication of metastatic nodules which reach the liver surface are due to necrosis and contraction at their centers This type is particularly prone to cause a friction rub

types of discrete abnormal masses within the liver substance It utilizes the familiar scintillation-counter method of surveying the hepatic areas for gaps in gamma radiation following intravenous administration of radioactive human serum albumin the tracer agent being I^{131} or Au^{198}

INTRAHEPATIC CALCIFICATIONS

Roentgen detection of calcifications within the liver area raises many diagnostic possibilities *By far the largest number of instances* represent simply calcific areas in the lungs or pleura the pleural reflection lies far down behind the liver as its shadow is examined *upon an abdominal* x ray film Study in the lateral projection clarifies the matter Another possible source of confusion is created by the discrete opacities which sometimes form in costal cartilages prior to their diffuse calcification It is not always easy to exclude by a plain film calcification which develops within the right adrenal gland kidney pancreas posterior abdominal wall muscles abdominal scars *mesentery or extrahepatic biliary system* but fluoroscopy or additional films in various projections usually permits easy differentiation This is not so however for *calcified aneurysms of the hepatic artery or* its branches because these lesions produce shadows which seem to lie up in the liver substance by whatever projection they are *studied*

True intrahepatic calcifications may be classified in this way

- I Intrahepatic lithiasis
- *II Tumor calcifications*
  - A Primary carcinoma
  - B Hemangioma (cavernous)
  - C Metastatic carcinoma or sarcoma
  - D Primary teratoma
- III Simple retention cysts
- IV Of infectious origin
  - A Tuberculosis
  - B Chronic pyogenic abscess
  - C Echinococcosis
  - D Infected hematoma
  - E Syphilitic gumma

Intrahepatic lithiasis is not at all rare but it is very unusual for the stones to contain sufficient calcium to render them radiopaque Most hepatic stones form in the small tributaries *of the intrahepatic biliary system* The patient in whom this happens often has outspoken gallbladder or other biliary tract disease In an occasional patient serial films *seem to indicate that stones* are able to migrate from the gallbladder in a retrograde fashion up into the intrahepatic biliary ducts Frequently hepatic stones are grouped together within a small area and there may be a great many of them Rarely there are several aggregates scattered through the liver substance

It is rare for liver tumors to become calcified but scattered reports suggest that any histologic form may do so Primary hepa

tomas seem the most common Phleboliths within hemangiomas are occasionally large enough to be recognized by x ray study and teratomas may contain calcified parts Metastatic tumors seldom calcify and when they do it is almost impossible to identify the shadows unless the presence of hepatic metastases has been suspected

Echinococcal cysts typically present upon calcification a thin circular ring of calcium or a segment of a ring If a reticulated pattern has been created it is said to be rather specific Healing of any localized infectious process within the liver substance may be accompanied by calcification The pattern of tuberculous calcification most often indicates miliary origin



Fig 190 Rather often the liver may be largely replaced by metastatic tumor with enlargement but no change in hepatic configuration

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ning Neither of course has any virtue for positive exclusion of metastases but the former is part of the *routine physical examination* and the latter can cause the patient no discomfort or hazard If a friction rub is heard over the liver of a patient with known gastrointestinal cancer the diagnosis of liver metastasis becomes rather certain Metastases must reach the liver surface and there can be *no appreciable ascites if a rub is to be produced* Although a recent innovation with problems yet to be solved the technic of radioactivity scanning promises to be a helpful means of detecting and localizing certain



Fig 189 Umbilication of metastatic nodules which reach the liver surface are due to necrosis and contraction at their centers *This* type is particularly prone to cause a friction rub

types of discrete abnormal masses within the liver substance It utilizes the familiar scintillation counter method of surveying the hepatic areas *for gaps in gamma radiation* following intravenous administration of radioactive human serum albumin the tracer agent being I^{131} or Au^{198}

INTRAHEPATIC CALCIFICATIONS

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CHAPTER 16

PORTAL HYPERTENSION AND ESOPHAGEAL VARICES

In this era the pathophysiology of portal hypertension and the clinical problems created by it have assumed special significance because effective technics for surgical portal decompression have finally become available to the clinician Esophageal varices are the most important manifestation of portal hypertension and hemorrhage is the danger of varices Quite naturally technologic advances in the surgical management of bleeding gastroduodenal ulcer have progressed much farther than those designed to eradicate esophageal varices and it is no surprise to find that varices have recently replaced ulcer as the most common cause of fatal gastrointestinal hemorrhage Nevertheless good technics are also available now for both emergency and definitive treatment of varices and although the dismal outlook for the patient with portal hypertension has only brightened a little therapeutic potentialities for the future appear very good It is important to understand of course that optimism for the patient with varices must continue to be limited to a considerable degree by certain very realistic problems some uncontrollable and others for the moment at least inscrutable For one thing the basic disease behind the portal hypertension usually cirrhosis cannot be much improved For another treatment of portal hypertension is based on application of measures which are not only physiologically makeshift but also quite dangerous Realistic management of varices implies positive radical prophylactic effort yet eventualities in the absence of treatment in terms of the probability of hemorrhage are most uncertain According to current understandings the seriousness of the underlying disease should be permitted to have only a relatively minor bearing on a dangerous approach which is merely prophylactic Finally for the mo

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or its contracture is largely responsible for the intrahepatic venous obstruction This is borne out by clinical experience for para doxically after prolonged vigorous medical therapy designed to assist the patient s liver to regenerate its depleted parenchyma his varices may become larger and more exten sive than they were before treatment began

Many other diffuse and localized diseases of the liver may be responsible as shown in the table In some of these the basis for portal hypertension is probably quite com plex involving pressure against large veins plus the effects of fibrosis and regenerating lobules In others simple pressure by an ex panding solitary lesion against a large branch of the portal vein may alone be responsible When sarcoidosis is accompanied by portal hypertension granulomatous involvement of the sublobular veins may be found It is par ticularly significant that varices may develop during the active phase of viral hepatitis In considering treatment as well as etiology it is most important to note that at times portal thrombosis or some other type of extrahepatic portal block is also present in the patient whose primary disease is cirrhosis

Extrahepatic venous block may occur either within the hepatic veins or within the portal vein or its tributaries The former which pro duces Chiari s disease is discussed elsewhere Most portal system blocks are due to throm bosis and this in turn is ordinarily secondary to pylephlebitis or inflammation of the portal vein Pylephlebitis may be a complication of any acute intra abdominal inflammatory process the most common being appendicitis and acute diverticulitis Frequently a history of such an episode some years in the past can be obtained when portal vein thrombosis is encountered Recanalization and the chronic changes of thrombus extension and regression rather than developmental factors are re sponsible for the cavernous transformation sometimes reported by the surgeon More often the end result of severely reacting pylephlebitis is a portal vein which has been transformed to a bloodless fibrous cord Local malignant tumors often enter the portal sys tem and grow rapidly both upstream and downstream This is particularly true of hepa toma carcinoma of the pancreas and carci noma of the stomach Rare causes of portal block are congenital aplasia pressure of ex trinsic inflammatory processes extrinsic cysts and tumors and portal involvement by arteri ovenous fistulas

In an occasional patient portal hyperten sion is caused not by block of outflow but by increased inflow Traumatic arteriovenous shunt is the main explanation In other cases of unrestricted portal outflow however no cause for portal hypertension can be found For the moment these must be categorized as idiopathic but the possibility that some ab normal physiologic quirk leads to increased perfusion pressure must be considered Un fortunately it is necessary to carry out most studies on portal pressure and on the behavior of varices while the patient is fasting Portal hemodynamics are influenced by the intestinal phase of digestion to an unknown degree

A special word is required about portal phlebosclerosis which was formerly con sidered a cause of portal vein block but which is now believed always to represent merely a complication of portal hypertension It is im portant to distinguish this process from the calcification of portal thrombi and from simple phleboliths Although reported mostly in adults portal phlebosclerosis occurs in infants and children with portal hypertension When portal hypertension has been active for some time the intima of the portal vein and its larger tributaries often develops thick ening with a varying degree of hyaline change This is not true endophlebitis and is not a manifestation of pylephlebitis Sudanophilic material accumulates and the appearance may be that of an atheromatous plaque Cal cifications usually of small amount may then occur Rarely a good portion of the portal system becomes calcified and a plain x ray film of the abdomen outlines it well

Superior caval hypertension is usually due either to pressure of a mediastinal tumor or to a caval arteriovenous fistula Often of course there is inferior vena caval hyper

ment the insecurity of relative ignorance over the natural history of portal hypertension and of varices renders all efforts less effective than they might be surgical technology has far outstripped physiologic and clinical understanding of varix behavior

CAUSES OF ESOPHAGEAL VARICES

A great variety of diseases can produce esophageal varices The clinician must take care that he not confine his concern for varices exclusively to his patients with cirrhosis or even to those with portal hypertension Whenever varices of the distal esophagus are present it is necessary too to remember that they are often associated with gastric varices and the latter are at times more dangerous as a source of hemorrhage than their esophageal extensions A useful classification of varices based on general etiology is as follows

- I Of distal esophagus
  - A Due to portal hypertension
    1. Intrahepatic block
    2. Extrahepatic block
    3. Increased inflow (arteriovenous fistula increased perfusion pressure)
  - B Due to superior caval hypertension
  - C Due to combined caval hypertension (heart failure constrictive pericarditis pregnancy)
  - D Idiopathic without venous hypertension
- II Of cervical esophagus primary

In the great majority of cases varices are associated with venous hypertension either of the portal system the superior vena caval system or the combined superior and inferior caval systems Under these conditions varices tend to be largest in either the distal or middle portion of the esophagus or equally large in the middle and distal thirds In addition varices are occasionally encountered in the distal esophagus in the absence of any evidence of venous hypertension True primary varices seem to be limited to a rare variety which occurs in the cervical esophagus The frequency of the various etiologies observed among 400 general hospital adult patients with varices is shown in Table 16 The common causes of portal hypertension among children are extrahepatic portal obstructions and to a lesser degree infantile cirrhosis Omphalitis is sometimes responsible for the former and rarer explanations are congenital valve like formations idiopathic portal vein stricture and simple venous atresia

TABLE 16 400 ADULT PATIENTS WITH ESOPHAGOSCOPICALLY DIAGNOSED ESOPHAGEAL VARICES DISTRIBUTION OF ETIOLOGIC DIAGNOSES

	No of Cases
Intrahepatic block diffuse liver disease	
Portal cirrhosis (including hemochromatosis)	262
Acute viral hepatitis	20
Portal fibrosis	19
Schistosomiasis	17
Fatty liver	7
Biliary cirrhosis	3
Hemosiderosis of liver	2
Amebic hepatitis	1
Intrahepatic block circumscribed liver disease	
Metastatic carcinoma	7
Hepatoma	4
Polycystic liver	1
Extrahepatic block	
Portal and/or splenic vein	17
Hepatic vein (Chiari s disease)	2
Combined caval hypertension	
Chronic heart failure (without portal cirrhosis)	11
Normal pregnancy (third trimester)	6
Others	
Idiopathic without venous hypertension	15
Primary of cervical esophagus	3
Achalasia	3

Schistosomiasis japonica and Manson s schistosomiasis are probably the most common causes of esophageal varices the world over Two mechanisms are at work schistosomal cirrhosis and venous block secondary to egg granulomas in the walls of the portal vein branches In this country portal cirrhosis is by far the most common cause Varices may be expected in approximately two thirds of cirrhotic patients who seek medical help Here it is believed that the action of regenerating liver lobules rather than fibrous tissue

ANATOMY OF VARICES

Varices of the stomach and esophagus form a part of one of the several native portacaval shunt systems which the body can call into play for draining blood away from the portal bed should flow through the portal vein liver and hepatic veins become insufficient to handle the load Other built in portacaval shunts include the inferior mesenteric hemorrhoidal vein system the retroperitoneal vein (Retzius) system the veins of the falciform ligament which connect with the periumbilical veins (Sappey) and the diaphragmatic internal mammary vein system Inconstantly in

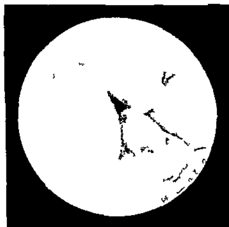


Fig 192 Esophagoscopic view of severe esophageal varices

women there is a prominent natural splenic ovarian vein shunt None of the by passing venous systems creates a problem in hemorrhage except the transcardial one In portal hypertension there is never spontaneous hemorrhage from dilated veins within the mediastinum or the peritoneal cavity All of the shunts are potentially available because after the late gestational period has passed the veins of the portal system contain no valves

Depending on the exact location of the venous block hypertension within the portal system may be either distributed throughout the total portal bed confined largely to its splenic portion or limited to the spleno inferior mesenteric areas The portal vein derives most of its blood from the mesenteric veins but about 25 per cent is contributed by the splenic vein When portal hypertension has a segmental distribution portal outflow is limited to fewer shunt systems although the extensive network of venous interconnections tends to disperse the hypertensive effects to some extent

Portal systemic venous connections exist normally across the cardia as small submucosal vessels on the order of venules (Fig 191) These are able to dilate quickly under the demands of portal hypertension Up in the esophagus the shunted blood is accepted by the submucosal veins and the great para esophageal venous plexus with its many interconnections Varices empty into the superior vena cava via the paraesophageal plexus the intercostal veins and the azygos system Why outflow through these large veins is not sufficiently unimpeded to eliminate the pressure gradient is a mystery

Esophageal varices appear during life as tortuous veins which are large enough to elevate the mucosa or when they are particularly severe and numerous as clusters of bulbous projections (Fig 192) When they approach their maximum diameter which is about 12 mm they may obliterate the esophageal lumen although in so doing they never produce obstructive symptoms Upon esophagoscopic examination they are not as blue as one might expect a matter controlled to some extent by the intensity and angle of illumination and the thickness of the overlying mucosa

NATURAL HISTORY

The major deterrent to proper application of available surgical technics for decompression of the portal system is ignorance over the natural history of varices The concept that varices are rather static structures which once identified persist as long as the illness remains relatively unchanged no longer appears acceptable Thus it is known that in at least 10 per cent of cirrhotic patients—perhaps many more—varices disappear and reappear spontaneously from time to time under the conditions of a static clinical pic

tension too and then the usual explanation is chronic heart failure or constrictive pericarditis Approximately half of patients with *chronic cardiac decompensation* have large varices and characteristically these are most severe in the middle third of the esophagus Probably all patients with constrictive pericarditis of significant degree develop varices Variceal hemorrhage in association with these diseases poses *a difficult therapeutic problem* because of pulmonary intolerance to trans

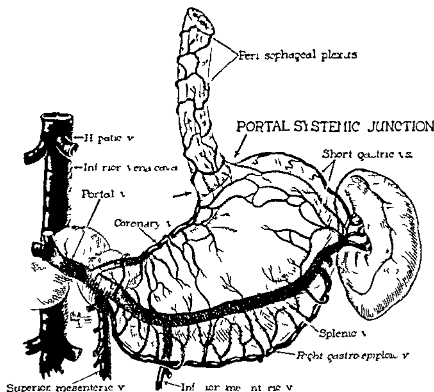


FIG 191 Epigastric portion of the normal portal circulation

fused blood About two thirds of pregnant women develop varices during the third trimester but the potent physiologic protective mechanisms of the pregnant woman seem to include some device for protection of her varices because hemorrhage is very rare One supposes that the hypervolemia of pregnancy and the mechanical pressure of the enlarging uterus are responsible for the portal hypertension

The two final classes are interesting because one appears to represent true primary varices and the other may be so Primary varices of the cervical esophagus are believed to be produced by tonic constricting action of the cricopharyngeus muscle on anomalous caudad extensions of the posterior pharyngeal venous plexus The resulting dilatations are limited to the posterior wall of the proximal few centimeters of the esophagus They call attention to their presence only if they should bleed and obviously this may be a particularly occult source of hemorrhage Diagnosis can be made only esophagoscopically and only then with difficulty unless the lesions are bleeding at the time of examination

Occasionally rather small varices are encountered in the distal portion of the esophagus in the proved or suspected absence of venous hypertension The lesions show no morphologic characteristics which might distinguish them from the commoner varieties At times in these cases achalasia is also present Causative mechanisms are not understood

arteriovenous shunts are contributing blood and therefore pressure to the portal system But something more than hydrodynamic pressure and the demands of portal volume flow controls the size and extent of varices because the one may remain static while the other exhibits important fluctuations

In the individual cirrhotic patient there is not close correlation between changes in portal venous pressure and changes in varix severity The discrepancy does not go so far as to permit varix diameter to become smaller when the portal pressure increases or vice versa but the pressure may show wide variation without changes in varix diameter Different patients with comparable portal pressures may have varices of remarkably different diameters and extents and some may have no varices at all Similarly the level of portal pressure cannot be estimated from the severity of varices Enlarging varices do not necessarily indicate rising portal pressure The degree of varix improvement following surgical portal decompression does not necessarily permit one to judge the degree of decompression achieved

When the varices of a patient with cirrhosis are examined at intervals over a long period it is found that there is no direct or reciprocal relationship between changes in varix severity and changes in the degree of ascites splenomegaly or hepatomegaly The state of the varices cannot be estimated from variations in the physical signs

It is not clear why varices begin to bleed That they do not simply burst from hydrostatic pressure is clear from the fact that other parts of the hypertensive portal system never bleed spontaneously and even its capillary network maintains its integrity It is probable that instead most varices begin to bleed because they are eroded into from the mucosal surface Erosive esophagitis is encountered frequently when the patient who is bleeding from varices is examined esophagoscopically On the other hand not always can esophagitis be proved at autopsy after a patient has exsanguinated from varices Once bleeding has begun obviously the level of the portal pressure becomes very important

If hydrostatic pressure is not important in initiation of hemorrhage it is difficult to explain the clinical observation that therapeutic measures which encourage hypervolemia may be complicated by sudden variceal bleeding The administration of plasma the adrenal steroid hormones and corticotropin to the patient with varices is attended by this danger It may be that these products have other influences over the integrity of the esophageal mucosa but specific information is wanting

DIAGNOSIS

Hematemesis in the cirrhotic patient does not by any means always indicate variceal bleeding In fact about one out of five cirrhotics examined during hemorrhage does not have varices at all and others have them but are bleeding from some other source On the other hand about one in two who never have had recognized bleeding is found to have them when first studied To reiterate a moment there is a small increase in the expected incidence of duodenal and probably gastric ulcer among people who have cirrhosis Erosive gastritis is a special hazard when there is portal hypertension and under these circumstances hemorrhage from it is characteristically severe Erosive esophagitis too is common and in addition to playing a role in initiating variceal bleeding it is a potent source of hemorrhage in its own right Finally the presence of cirrhosis confers no immunity against all the other bleeding diseases of man

Physical examination gives little help in judging whether a cirrhotic or other patient has varices Absence of varices cannot be assumed merely because the basic disease seems mild Furthermore no sense of security regarding the state of varices which already have been detected can be drawn from an improving clinical picture Prominence of intra abdominal signs which imply portal hypertension such as splenomegaly and ascites does not parallel either the presence or the severity of varices Strangely of all the physical stigmas that may be found in the patient

ture and apparently static liver disease In some or most cases it is possible that varices fluctuate quickly from day to day or hour to hour in response to undetected pathophysiologic variables but hourly esophagoscopic study would be necessary to find it out When he recommends the major and stressful surgical procedure of portal decompression the gastroenterologist does so knowing that it is possible that the varices might go away by themselves if left alone

portal outflow at others The normal range of portal venous pressure during the fasting state varies from 100 to 160 mm of water There are apparently wide variations normally governed by the venous demands of the different phases of digestion When the pressure is elevated by disease presumably the varying demands continue to exert their influence over the volume of portal outflow In cirrhosis the pressure may amount to 600 mm A cough elevates the pressure momentarily



FIG 193 Roentgen appearance of severe varices of distal esophagus with partial obliteration by large barium bolus (*left*) and in relief (*right*)

about 40 mm while a sustained Valsalva maneuver may raise it 300 mm The liver whose volume cannot change quickly because it is bound by fibrosis as in cirrhosis must handle small increases in hepatic artery pressure by developing abnormally high resistance to portal venous inflow and the result is that a relatively slight increase in hepatic artery pressure causes a large increase in portal vein pressure In some cirrhotic patients the oxygen content of the portal blood is higher than that of normals and the percentage of portal b ood oxygenation increases as the cirrhosis progresses suggesting that

Presumably varices ordinarily develop in response to the demands of a hypertensive portal system The mechanisms controlling their subsequent fluctuations are not understood Discovery that varices may develop as soon as seven days after the onset of acute viral hepatitis is evidence that the native esophagogastric venous connections can become mobilized very quickly It is probable that the several native shunt systems act at times in a reciprocal fashion rather than in concert so that one or more including esophageal varices handle a small volume of blood during certain periods and the major

the same as that used for sclerosing therapy of varices

The portal circulation time can be roughly estimated by quickly injecting the vapor of 3 ml of ethyl ether high into the empty rectum and measuring the time required for an observer to note the appearance of ether odor on the patient s breath This is then a rectum to lung circulation time It is in constantly prolonged in portal hypertension The three main inaccuracies stem from varying olfactory sensibilities of different observers from apparent variations in rapidity of absorption of the vapor from the rectum and from the fact that at least some blood draining the highest levels of the rectal mucosa passes into the systemic veins if there be portal hypertension In the normal subject the portal circulation time is measured by this technic has a mean of about 30 seconds with wide variations In spite of its lack of precision the test may be useful for determining the patency of a surgical shunt provided a preoperative determination was obtained

SPLENOPORTOGRAPHY

The surgeon who is about to carry out an operation for portal decompression is assisted immeasurably by advanced knowledge of the functioning anatomy of his patient s portal system This can be obtained before operation by percutaneous injection of radiopaque fluid into the spleen and rapid exposure of several roentgenograms over the upper abdomen The course and length of the various major veins are outlined and anomalous or unusual venous connections can be recognized Accurate interpretation requires detailed knowledge of portal anatomy and physiology Most important obstructions within the portal and splenic veins are demonstrated and accurately localized This is especially helpful information because even though liver disease may be the basic process there may be extrahepatic block too Thus a fruitless operation on the patient s right side in anticipation of a portacaval shunt can be avoided if the portal vein is recognized ahead of time as unsuitable for anastomosis and the left approach for splenorenal shunt can be immediately planned Direct venography at the time of operation is far less helpful because the incision will already have been made Some information can at times be obtained by injecting the dye under pressure into a distended periumbilical vein if one be available

The technic of percutaneous splenoportography involves splenic puncture with a #20 gauge spinal needle usually through the ninth or tenth interspace in the midaxillary line About 40 to 70 ml of 70 per cent sodium acetrizoate (Urokon) or other contrast medium is injected in about 5 seconds Films are taken immediately and at 1 second intervals for 10 seconds The main complication is serious hemorrhage from the punctured spleen Because of this possibility many surgeons carry out percutaneous splenoportography on the operating table immediately before carrying out the shunt

EMERGENCY CONTROL OF VARICEAL HEMORRHAGE

Although effective technics are now available for emergency control of variceal bleeding the threat of hemorrhage to the patient with cirrhosis continues to be very great This is of course because initiation of irreversible liver failure not exsanguination is the outcome in most fatal cases and even bleeding which is quickly stopped is frequently sufficient to precipitate hepatic coma Quick blood replacement is important in dealing with any case of hemorrhage but when there is diffuse liver disease it cannot be relied upon to preserve hepatic competence The varices themselves may be handled either by tamponade or direct surgical attack

The most generally useful means of controlling variceal bleeding is pneumatic tamponade with the Sengstaken tube or variation thereof (Fig 195) This is a triple lumen rubber device with independent gastric and esophageal balloons and a central aspirating channel In the Sengstaken design the caudad

with cirrhosis the presence of spider angiomas correlates best with the presence of varices Approximately two thirds of patients with varices have spider angiomas while only one third of those without varices have them

Although distended abdominal veins with blood flow in the caudad direction are a reliable sign of portal hypertension they do not necessarily indicate that varices are present There is some evidence however that when abdominal veins are studied by infra red photography thus eliminating some of the inaccuracy injected by variations in skin trans

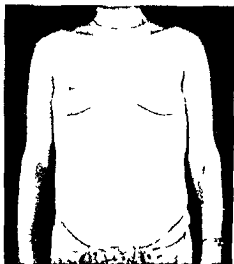


Fig 194 Infra red photograph of distended abdominal veins in case of portal hypertension secondary to portal cirrhosis

lucency and in the amount of masking skin fat correlation with the presence of varices is better (Fig 194) At that routine infra red photographic study of the patient with portal hypertension furnishes little diagnostic information It is one means of obtaining an objective record for comparison of the preoperative and postoperative state of the superficial veins but it does not measure any basic alteration in portal hemodynamics

The only efficient method by which esophageal varices can be diagnosed is esophagoscopic examination The procedure does not introduce a risk of hemorrhage when varices are present Any vein which under 4 diameter telescopic magnification is seen to elevate the esophageal mucosa when the patient is not straining is abnormal and can be called a varix Roentgenologic study by experienced radiologists can be expected to reveal varices in about 25 per cent of patients in whom they can be demonstrated esophagoscopically (Fig 193) They often may be found by splenoportagram but this of course is too vigorous a technic for routine use Autopsy examination is notoriously unreliable for demonstrating varices If one depends on roentgenologic and autopsy information he will gain a wholly erroneous impression of variceal incidence

VARIX MENSURATION

In order to judge the course of untreated varices to evaluate the results of surgical portal decompression and to gain information helpful in understanding the natural history of varices it is desirable when facilities are available to make measurements of the extent of the esophagus they involve the diameter of the veins and the venous pressure within the varices This can be done during esophagoscopic examination Mensuration is always carried out while the patient is in the fasting state so that there will be the benefit of a physiologic baseline in a situation which is marked by physiologic variables The extent of esophageal involvement is measured in centimeters by ascertaining the length of the instrument which has been inserted at the time the most proximal varix is encountered Diameter is measured with a trans esophagoscopic ruler and expressed in terms of an estimated mean of the diameters found in the segment of the esophagus most severely involved In order to avoid the trap of false precision the results must be expressed merely as mild when the mean diameter seems to be less than 3 mm moderate when it is between 3 and 6 mm and severe when it is more than 6 mm The technic for measuring portal venous pressure is a difficult although safe one performed by needle puncture of a varix and direct open manometry The equipment is very simple being

in use the tube should be hung up by its end Like all rubber tubes designed for transoral use it should never be coiled To both patient and doctor a bent tube is a devilish device

The risk of complications during pneumatic tamponade is considerable In addition to the facts that it does not always stop hemorrhage and that it has all the inherent annoyances of any intragastric tube which a sick person does not want put there or kept there the danger of regurgitation of the inflated balloons into the pharynx with laryngeal obstruction and asphyxiation constitutes a constant threat It is remarkable how easily and quickly a patient may deliver the gastric balloon containing perhaps 200 ml of air from stomach to pharynx and how regularly it becomes stuck there to kill quickly unless certain precautions are observed The Sengstaken tube or any variety thereof should not be passed through the nose because this makes it too difficult to remove quickly A pair of scissors should be kept tied to the end of the aspirating channel where it will always be immediately available for severing the air channels and puncturing the balloons should they rise into the throat Even though it places a strain on personnel facilities a patient being treated by pneumatic tamponade must have a constant attendant

Emergency surgical measures currently employed from time to time for control of actively bleeding varices are partial esophagogastrectomy transthoracic ligation of the varices of the distal esophagus and venous shunt The first two are strictly temporizing operations They increase the burden on the portal venous system aggravate any gastric varices which may remain and probably encourage erosive gastritis They do not eliminate varices and their use implies tacit understanding that a definitive surgical shunt procedure will have to be done if the patient survives Despite these serious shortcomings both emergency partial esophagogastrectomy and ligation of bleeding varices have found rather wide usage Justification comes from the observation that this type of operation will in most cases assure control of the bleeding for the moment Most survivors seem safe from hemorrhage for at least three months Obviously only the desperately ill patient whose bleeding cannot be stopped by tamponade meets the criteria for this attack Obviously too it is particularly important that it be proved by esophagoscopic examination first that the bleeding is coming from esophageal varices The operative risk is very great but under the circumstances this can be only a relative consideration

Application of the technics of definitive portal decompression to emergency control of actively bleeding varices theoretically should provide an ideal radical approach to the problem They combine both effective emergency therapy and effective definitive therapy They create no new problems for the varices or the portal system Emergency splenorenal shunt is a relatively safe procedure for managing bleeding varices when the obstruction is known to be extrahepatic The liver is severely taxed if cirrhosis be the primary disease however and a great deal of further experience must be gathered before the risk of emergency portacaval shunt in cirrhotic patients can be evaluated

DEFINITIVE THERAPY OF ESOPHAGEAL VARICES

It is fair to state that ideally all patients who have esophageal varices which are secondary to the portal hypertension of either diffuse liver disease or extrahepatic portal block should be considered for surgical portal decompression If the portal vein is not obstructed as determined by pre incision splenoportagram end to-side portacaval shunt is by far the best operation as judged by the degree of decompression achieved and the slight chance of spontaneous closure of the anastomosis (Fig 196) End to-side splenorenal shunt is done if the portal vein is found by splenoportagram to be blocked It is not as effective an operation as portacaval shunt Occasionally after opening the

half of the sausage shaped esophageal balloon is made of extra thick rubber to discourage its bulging out and drawing itself down into the stomach The tube is passed orally until well within the stomach the gastric balloon is inflated with about 200 ml of air and the apparatus is pulled up until the balloon is tightly wedged against the cardia The esophageal balloon is then inflated to a pressure of 600 mm of water nometers—easily converted from sphygmomanometers—so that optimum inflation is maintained constantly Slow leaks are common Constant aspiration through the central channel is important for a day or so in order that nausea and the chances of ejection of the tube may be kept to a minimum

Ideally tamponade should be discontinued after three days have passed because important esophageal mucosal damage may be

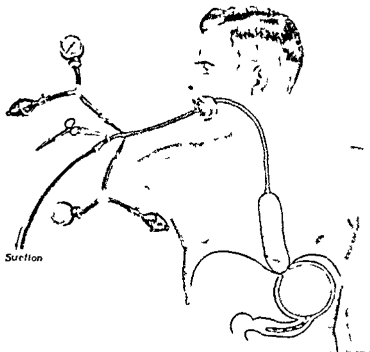


*Fig 195 Arrangement of equipment while applying pneumatic tamponade with the Sengstaken tube for emergency control of varices*ceal bleeding

produced if pressure is maintained much longer than this Severe esophagitis actual ulceration and even deep necrosis have been encountered after several days of balloon pressure Sometimes however deflation of the balloons in preparation for removal of the tube is followed immediately by fresh hemorrhage whereupon it is necessary to reinflate for further tamponade After the tube has been withdrawn it is wise to give bismuth subcarbonate in frequent oral doses as a gesture towards protection of the mucosa which overlies the varices until definitive therapy can be accomplished *When not*

Although some clinicians believe that pressure exerted against the cardia by itself provides adequate interruption of the varices clinical experience as well as appreciation of the manifold connections between varices and the periesophageal plexus suggests that tamponade within the esophagus is important The tube is fixed in position with a little *traction* To accomplish this effectively with least discomfort to the patient a smooth rubber ball may be cut in two and taped around the tube to rest against the corner of the mouth *It is important* to connect the channels from both balloons to ma

with mild cirrhosis and often such is the case Another quasi paradox is that advanced age is in itself no deterrent to successful operative results Patients in the eighth decade withstand the stress of the procedure as well as—and often it seems better than—youngsters

For the individual patient operation is usually contraindicated for the moment if the general clinical course is either getting better or getting worse No longer can one think in terms of absolute minimal requirements for specific physical signs and liver function tests as guides to predicting whether a patient will withstand the operation The main thing is a stable course The operation should not be done until the patient has attained maximum clinical and laboratory improvement or until deterioration has ceased It makes little difference whether ascites is present at the time of operation or whether the liver function tests are quite abnormal Relative exceptions concern the levels of the serum bilirubin prothrombin activity and albumin which one would like to have as close to normal as possible Nevertheless even a considerable degree of jaundice or hypoalbuminemia is not necessarily a contraindication to operation once maximum improvement to medical therapy has been attained The final decision regarding the advisability of proceeding with operation is then a matter of judging whether the liver will be able to carry the patient through the period of postoperative stress

Preoperative preparation with oral Aureomycin and postoperative use of intravenous Aureomycin appear to furnish a degree of prophylaxis against hepatic decompensation Oxygen ether anesthesia is ordinarily used but evidence is accumulating to show that supplementation with refrigeration anesthesia may be better For portacaval shunt a long right thoracicoabdominal approach is used a rib resected the right diaphragm split radially the liver dislocated upward the portal vein freed and severed as high as possible and its end anastomosed to the side of the inferior vena cava The approach for the splenorenal anastomosis is left thoracicoabdominal Here the spleen is removed and the end of the splenic vein is swung over for anastomosis with the side of the left renal vein The kidney is not sacrificed The main problem facing the surgeon within the abdomen is massed varices throughout the area in which he must work These tend to bleed very easily creating both annoyance and delay Evidence of block of the hepatic lymphatics is usually encountered in the form of very large lymphatic channels about the hilum of the liver and a thick edematous gallbladder It almost always proves a serious mistake to carry out another incidental surgical procedure such as cholecystectomy during an operation for portal decompression

POSTOPERATIVE COURSE AND PROGNOSIS

The operative mortality rate for surgical portal decompression ranges from 7 to 12 per cent depending of course on the type of patient population being treated Cirrhotic patients regularly fare much worse than do patients with extrahepatic portal block The cause of death is usually hepatic decompensation the first 12 postoperative days constituting the main danger period During this time serum bilirubin and bromsulfalein retention usually rise quickly and then fall slowly Serum albumin concentration often drops following shunt and may not return to preoperative levels for several weeks Interestingly enough the flocculation tests improve and may become normal immediately after operation only to return slowly to preoperative levels In long term effect complete venous by pass of the cirrhotic liver does not ordinarily compromise hepatic efficiency beyond that which existed prior to operation It makes no permanent addition to extant liver injury and in some instances it improves hepatic competence The big problem is to assure maximum help for the liver during *the immediate postoperative period In addition* to routine intravenous Aureomycin use of glutamic acid or its sodium and potassium salts is probably indicated if signs of

thorax and abdomen the surgeon finds a better vein than either of these for establishing an anastomosis—the superior mesenteric or a large aberrant vein perhaps The presence of hypersplenism with significant thrombocytopenia in patients with intrahepatic block often raises the question of whether *it is not better to select the less effective* operation of splenorenal anastomosis in order that the opportunity may be made to remove the spleen Splenectomy cannot be performed through the surgical approach used

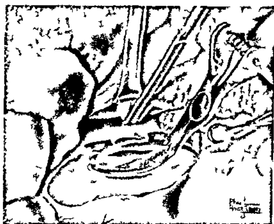


FIG 196 Anatomic appearances just prior to portacaval anastomosis The portal vein is being brought down after having been severed at its branching close to the liver An elipse has been cut from the caval wall to receive the end of the portal vein

for portacaval shunt As a generality it can be said that portal decompression achieved by portacaval shunt is adequate to assure satisfactory resolution of congestive hyper*splenism in most cases and that this opera*tion can be done with confidence under these circumstances The spleen should never be sacrificed in the presence of portal hypertension without *using the opportunity to* perform a splenorenal anastomosis whether or not the plans call for subsequent portacaval anastomosis Hepatic artery ligation splenic artery ligation and simple *splenectomy are* not useful for achieving portal decompression

The chief indication for portal decompression is simply the presence of varices Because among cirrhotic patients the first episode of hemorrhage carries a mortality *rate of 50 per cent or more* a realistic approach to treatment requires as vigorous effort for the patient who has never had a hemorrhage as for the one who has demonstrated that he can bleed The problem of varices is that of their potentialities and it cannot be solved if one insists on waiting for hemorrhage before carrying out prophylaxis The point is that definitive surgical treatment is prophylactic treatment the patient is made better only because the possibility of future hemorrhage has been eliminated or almost eliminated Although the risks of surgical portal decompression are not inconsiderable the risks of the first hemor*rhage are very much worse The problem* of distinguishing the cirrhotic patient who is likely to bleed in the future from the one who will go through life without bleeding remains unanswerable

Contraindications to surgical portal decompression must necessarily be viewed in a wholly relative light considering the danger of varices To the cirrhotic patient the threat of the operation is mainly that of liver decompensation so that in selecting patients for shunt clinical estimation that the liver will not be able to withstand the stress of operation is the chief contraindication During the past few years however an interesting and important paradox has been observed in connection with liver function and liver ability to meet the physiologic demands of the postoperative period This hinges on whether or not the basic disease process has made it necessary for the liver already to have become accustomed to doing without much blood from the portal system If the *liver has been able to function* satisfactorily with complete or almost complete obstruction to portal flow—either intrahepatic or extrahepatic—the chances are good that a *surgical shunt will be well tolerated* As far as intrahepatic block is concerned this means that the patient with severe cirrhosis may tolerate operation better than the patient

gastrectomy increases the venous burden on the portal system tends to raise portal pressure and may encourage development of gastric varices and erosive gastritis Because of the danger of gastric varices especially sclerosis as a definitive gesture cannot be carried out unless gastroscopic examination has shown that none is present

This is a physiologic makeshift way of handling the problem of esophageal varices yet there are certain clinical situations in which it can be helpful During active hemorrhage injection of a total of 10 ml of sodium morrhuate into the caudad portions of the bleeding vein and a couple of near by ones followed immediately by pneumatic tamponade seems to add something to the efficiency of tamponade itself This is intended as an emergency procedure only carried out without regard to the possible presence of gastric varices A course of sclerosis therapy is indicated as a poor substitute for definitive surgical management whenever operation is believed to be inadvisable and whenever varices persist following portal decompression This latter situation is usually encountered only after splenorenal shunt

The procedure involves passage of a Sengstaken tube transesophagoscopic injection of a total of 10 ml of the sclerosing solution usually 5 per cent sodium morrhuate as far caudad as possible into the three largest varices and immediate inflation of the balloons The Sengstaken tube is left in place overnight The process is repeated at intervals of a few days or a week with systematic injection of remaining veins Many repeats may be necessary for the decision to treat by sclerosis necessarily implies treatment to complete obliteration After all varices appear to have been eradicated it is necessary to plan on regular periodic re examinations because others may spring up as time goes on The technic of sclerosis demands the ultimate in patience from both patient and doctor and the main prerequisite is an endoscopist who is enthusiastic as well as competent

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hepatic decompensation appear As has already been pointed out the evidence regarding the usefulness of glutamic acid in treatment of liver failure is not entirely convincing The postshunt cirrhotic patient is particularly sensitive to exogenous sources of ammonium ion and it is important that he receive no ammonium salts and that protein intake not be in excess of normal nutritional requirements

Occasionally the patient dies during the first few postoperative days from some unidentified major breakdown in the hemostatic mechanism quite independent of the ordinary recognized hemostatic faults There is uncontrolled hemorrhage from all peritoneal surfaces and rarely from all mucous membranes This may happen even when detailed preoperative studies have failed to reveal any clotting defect and thus it cannot be predicted Although it appears to be independent of any hypersplenism factor *the cause is not understood*

In the majority of patients treated by portacaval shunt the varices disappear in *from three to six weeks and do not return* Thrombosis or contraction of the anastomosis rarely occurs provided that the surgical technic has included excision of an elipse of the caval wall prior to anastomosis Varices disappear infrequently following splenorenal shunt although they become much smaller and less extensive Sometimes splenorenal shunts close over with reconstitution of the varices

The number and severity of bleeding episodes are tremendously reduced following successful portal decompression Patients who have been treated by portacaval anastomosis infrequently bleed again If they should blood loss is of small amount Results are not expected *to be quite as good following* splenorenal shunt

Certain chronic postoperative problems are *to be* anticipated among cirrhotic patients The operation does not cure alcoholism and by the end of five years many patients will have died of progressive liver disease On the other hand many will be found to be well and gainfully employed at occupations demanding hard physical exercise The usual pattern lies in between the patient returning to his preoperative life and habits of periodic sickness and part time work as dictated by his basic illness Sometimes portal decompression will have cured his ascites at others ascites appears for the first time following operation In the latter case it frequently disappears again within a month or two Edema of the legs at times with lower extremity varicosities is a moderately common sequel of operation explained perhaps by increased inferior vena caval pressure Persisting thoracic wall pain under the incision is to some patients the most bothersome residual of operation In an occasional case active pulmonary tuberculosis appears within a few months of portal decompression as it does after other types of major operation

A special word must be said regarding personality changes following portal decompression *In approximately a third of the patients* such changes are noted whether the basic disease is cirrhosis or simple extrahepatic *portal block They are much more striking* in men than in women The problem is not the familiar neurologic one of a failing liver but rather a personality and emotional disturbance The main features are loss of initiative and failure to assume responsibility for self and family Strong men may become dependent weaklings It is not that they are basically frightened but they seem more than naturally willing to use their illness as an excuse for avoiding the simple responsibilities of living as adults No doubt there is an iatrogenic factor at work but the mechanism includes *more than this* A combination of interview therapy and social service help can be effective in achieving *and maintaining* rehabilitation

OBLITERATION OF VARICES BY INJECTION OF SCLEROSING AGENTS

Varices can be obliterated by injecting a sclerosing solution into them through the esophagoscope This method like transthoracic varix ligation and partial esophago

mon duct becomes obstructed the bile is merely resorbed into the general circulation after it has passed through the liver cells Some is excreted in the urine and some is deposited in the tissues The intestine is not given the chance to form urobilinogen Unfortunately it is not quite as simple as this largely because extrahepatic obstruction is not often complete and when it is it is likely to be complete only for variable periods at a time Constant leaking or large gushes of bile into the duodenum from time to time may confuse biochemical evaluation considerably and secondary ascending cholangitis with progressive hepatocellular injury may eventually lead to biochemical chaos Again it must be emphasized that diagnosis in the face of jaundice is a bedside responsibility and that chemical tests play only a secondary part in the diagnostic decision by furnishing quantitative information

Bile which is iso osmotic with the blood when it is formed is produced in the adult in an amount of about 1500 ml daily as long as extrahepatic biliary flow is free Introduction of bile salts themselves into the intestine appears to be the most potent stimulus to normal bile formation When T tube drainage of the cholecystectomized biliary tract is in effect and little bile is reaching the intestine it is found that bile output drops to from 300 to 600 ml daily If obstruction which has been chronic is suddenly relieved by surgical means periodic duodenal drainage then shows that the bile which enters the bowel contains no bile salts for from 1 to about 14 days depending on how quickly the liver cells recover from the effects of obstruction Normally about 90 per cent of the bile salts which reach the intestine are resorbed in the course of their well known circulation synthesis during protein metabolism making up for that which is lost

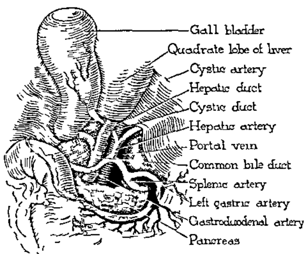


FIG 197 Anatomic relationships of ducts arteries and veins at the hepatic pedicle Normal variations are common

If the gallbladder is present sudden complete obstruction of the common duct does not lead to hyperbilirubinemia for from 18 to 24 hours If the gallbladder has been removed the serum bilirubin becomes elevated within about six or eight hours Other biliary excretory functions are affected similarly In either case serum alkaline phosphatase activity soon reaches high levels as eventually does serum cholesterol The stools become acholic Complete biliary obstruction of one cause or another can be declared with certainty if the daily fecal urobilinogen output becomes less than 5 mg daily the normal

CHAPTER 17

EXTRAHEPATIC BILIARY TRACT

INTRODUCTION

Diseases of the extrahepatic biliary tract are so common and are now relatively so easy to study that there is hope for eventual dissipation of the bad reputation which for so many years has surrounded biliary tract therapy The gallbladder has been a favorite professional whipping boy for two main reasons First even though the duct system does not have the rugged resistance to surgical manipulation demonstrated by many of the viscera the gallbladder has proved handy and even attractive for elective operative management because physiologically it is expendable Second and more important it is very difficult to estimate the clinical importance of biliary disease once it has been detected There is a great deal more gall bladder disease about than people sick with gallbladder disease The magnitude of the potential problem and the relative unimportance of the real problem can be understood from the pathologists frequent statement that the biliary tract is normal in only 40 per cent of routine adult autopsies Professional gallbladder consciousness and efficient roentgenologic detection methods make the anatomic abnormalities easy to find during life whether or not they are of any clinical importance Their eradication may not help the patient and another gallbladder failure results The most important matter in management of diseases of the extrahepatic biliary tract is bed side evaluation of the patient s problem and no technical advance can make this easier

EXTRAHEPATIC OBSTRUCTIVE JAUNDICE

Of the different forms of jaundice mentioned briefly in the introduction to the chapter on liver diseases this type is easiest to understand and to recognize If the com

of bradycardia are more common when jaundice is due to extrahepatic obstruction than when diffuse liver disease is at fault They are believed to be due to retention of bile salts If obstruction has led to infection and ascending cholangitis a degree of hepatomegaly and liver tenderness can be expected Charcot s intermittent fever which is due to recurrent biliary obstruction with secondary cholangitis is characterized by periodic attacks of chills fever and sweating Often pain is absent but jaundice which is variable may deepen after each paroxysm

After the common duct has been obstructed for some time acholia or failure of bile production may result In addition to depression of bile formation through inability of the bile salts to reach the intestine the hepatic cells may cease to secrete bile altogether after the intracholedochal pressure has risen above 300 mm Acholia probably occurs over short periods much more often than is recognized clinically It is known that it can occur briefly during acute hepatocellular diseases in the absence of ductal obstruction but there is no way to detect it ordinarily In the case of common duct obstruction it can be recognized only when at either operation or autopsy white bile is discovered in the biliary tract Actually development of sufficient intracholedochal pressure to produce acholia is a rare sequel of common duct obstruction because several physiologic defensive mechanisms come into play especially cessation of bile salt stimulation elasticity of the biliary channels and absorption by the ductal mucosa of fluid from the retained bile

In cases of acholia secondary to ductal obstruction the gallbladder and ducts become filled with thin clear colorless fluid It is probable that the color is lost through *in situ* progression of the chemical change from bilirubin to nearly colorless biliverdin a conversion which is accelerated by the presence of bacterial infection The degree of clinical jaundice tends to become static in spite of continued complete obstruction because bile formation has ceased The serum bilirubin level is usually only moderately elevated at the time white bile is discovered

GALLSTONES

Gallstones accompany and often are responsible for the biliary disease of most afflicted people it is just as important to recognize that most people who have gallstones are never made sick by them Figures expressing the general incidence of gallstones necessarily gathered from autopsy study vary from series to series and from country to country It may be fair to conclude that in the United States about 12 per cent of adult males and 20 per cent of adult females have gallstones at the time of death In Europe the preponderance of women is more striking while in the Orient there seems to be no sex preference There is some evidence that the incidence is slowly increasing all over the world Sex is quite obviously the most important factor controlling incidence in this country and Europe In spite of a common belief to the contrary it is clear that parity does not encourage gallstone formation About 80 per cent of women who are found at autopsy to have gallstones have borne children but approximately the same percentage of all autopsied women have borne children Although pregnancy cannot account for the greater incidence among women it may be that hormonal influences during the period of female reproductivity can Up to the age of 10 years boys are a bit more prone to develop gallstones than girls Then during adulthood women tend to develop them much earlier in life than men After middle life has been reached the increase in incidence with advancing age becomes comparable between the two sexes

Incidence increases rapidly with age the sharpest occurring in the sixth decade Autopsy records for children show the incidence of cholelithiasis to be about 0 3 per cent It has been reported in the fetus and during the first year of life Up to the age of 40 years the incidence appears to be about 3 per cent at 65 years it is about 25 per cent and after 80 years about 35 per cent

being from 50 to 200 mg Urinary urobilinogen is absent or present in only very small amounts The urine is however dark with bilirubin and its total bile salt content is very high Tests of hepatocellular function remain normal until the effects of back pressure *and often ascending cholangitis are* felt Tissue removed by liver biopsy shows the rather specific picture of biliary stasis

At the initial examination a reasonably secure distinction can probably be made in about 75 per cent of jaundiced patients If the degree of skin discoloration is only mild it may be more difficult to exclude the possibility of hemolytic jaundice on clinical grounds alone The shade of the jaundice may be to a suggestive degree distinctive for the different forms but this is so only late



FIG 198 Relationship of normal gallbladder to stomach and duodenum

plus whatever cholangitis may have developed *When obstruction is partial or intermittent* biochemical tests have much less value for quantitative evaluation The degree of retention of bile elements in the blood fluctuates and whenever bile enters the intestine the urobilinogen cycle is re established

Clinically extrahepatic obstructive jaundice may behave differently from intrahepatic jaundice or it may have no distinguishing features This depends largely on the completeness and duration of the obstruction

in the course of hyperbilirubinemia too late *to assist with the initial* diagnosis The mere intensity of the jaundice itself is often helpful for judging the nature of the disease but again only late in the course It is possible in very rare instances of *hepatocellular* jaundice for the serum bilirubin to rise as high as 60 mg per 100 ml of blood but as a general rule jaundice which is due to more than 35 mg is the result of duct obstruction

Pruritis and the occasional manifestation

As the bile is concentrated in the gallbladder it becomes less alkaline and possibly slightly acid Deconjugation of fatty acids occurs At the normal pH of the gallbladder contents the bile salts act to keep the fatty acids in solution and this in turn keeps cholesterol in solution If the bile salts are removed a precipitate of fatty acids and cholesterol forms This happens in the inflamed gallbladder which fails to empty itself properly because the bile salts are the most diffusible of the three It seems likely that gallstones contain no appreciable amount of fatty acids because organic breakdown too quickly converts them to more diffusible forms

Rather often the material from which gallstones are made does not become adherent and balled up but remaining amorphous exists as heavy mud or sand in the gallbladder and at times in the ducts This is to be distinguished from highly concentrated bile and from mucus and organic debris which may cause troubles of their own and which may be mixed in with biliary sand The material is composed of the same constituents found in formed stones but the cholesterol content is low Milk of calcium bile is a mixture of bile and a heavy suspension of calcium salts which make it radiopaque It apparently forms only in the presence of a cystic duct stone which is causing incomplete obstruction Discovery of a radiopaque gallbladder during upper gastrointestinal contrast fluoroscopy must raise the question of milk of calcium bile in addition to the possibility of a cholecystic fistula

Roentgen study of dry stones from about 15 per cent of patients reveals stellate fissures apparently representing shrinkage cracks During life the fissures almost always are filled with fluid and thus escape notice In rare cases they become filled with gas presumably as a result of bacterial activity and decay of mucus or other organic debris which stones contain Gas filled fissures may be recognizable as such on plain x ray films of the gallbladder area even though the stones themselves are radiolucent

BILIARY VS CARDIAC DISEASE

At every turn in his dealings with biliary tract disease the clinician faces difficult interpretational problems in differential diagnosis Most of these concern cardiac disease It is hard to know what to think about the reflex influence of gallbladder stimulation on cardiac conduction coronary artery flow and heart symptoms The problem comes up very often in the practice of gastroenterology It is frequently difficult enough to distinguish between pains originating in the biliary tract and those originating in the myocardium even if one should assume that the one organ has no influence over the other Some experienced clinicians believe that similarity of subjective complaints is not surprising because certain types of biliary disease cause simultaneous reflex narrowing of the coronary arteries But the matter is far from proved

A few things can be stated with assurance in relation to cardiac conduction There are cholecystocardiac reflexes although it is not certain how far they may go During gallbladder surgery if either the gallbladder itself or the cystic duct has already been distended for a day or two manipulation may cause premature contractions In some patients continuous electrocardiography reveals short runs of more serious conduction abnormalities during periods when traction is applied to the gallbladder This may happen even though preoperative medication has included atropine but often additional atropine during operation prevents further cardiac irregularities In some people cholecystectomy is followed by disappearance of premature contractions of long standing Improvement and even cure of Adams Stokes attacks have been reported following removal of a diseased gallbladder

The influence of biliary disease over coronary artery flow is known only through most fragmentary information Clinically the question is often merely that of differential diagnosis but the clinician finds himself insecure over the possibility that there is disease of

Geographic influences on susceptibility to gallstone formation seem superficially to be rather potent but it is probable that they reflect only differences in racial susceptibility Although the possible influence of dietary habits especially fat intake has been the object of much theorization substantial conclusions are wanting Some observers have found more gallstones among well fed people and some have found less On the other hand it is clear that Caucasians are the most susceptible of people Negroes are considerably less so and probably the Oriental races fall somewhere in between Cholecystic disease of all types is very rare in Negro children

There are some specific diseases which increase susceptibility to cholelithiasis Heading the list are all of the chronic hemolytic diseases and processes Apparently the connection is merely one of increased concentration of pigments in the bile for the stones formed in these diseases are of the pigment type People with pernicious anemia are somewhat more susceptible to all forms of biliary disease including cholelithiasis than other people but even though erythrocyte survival time is decreased in this disease the incidence of pigment stones among them does not seem particularly striking Gallstones are no more common among people with portal cirrhosis than others There is some suggestion that the incidence is greater than expected among patients with obesity diabetes and generalized arteriosclerosis but the data are not especially convincing Although hypothyroidism and cholelithiasis have certain aspects in common and although artificially induced hypothyroidism regularly leads to gallbladder stasis no connection between the two diseases has been observed clinically The frequent association of gallstones with pancreatitis is well known but here there is a cause and effect relationship

Except in the case of pigment stones enumeration of the conditions with which gallstones are commonly associated does not give much information regarding etiology Their formation seems to depend largely on abnormalities of the bile s physical chemistry and for this reason some knowledge of their chemical and physical characteristics is important The constituents are complex often including concentric laminae of varying composition Ninety five per cent of human gallstones however are very high in cholesterol content and almost all contain at least a little calcium and bile pigment The gallstones of only from 8 to 10 per cent of affected people contain enough calcium to render them radiopaque Pure cholesterol stones which are not common are white often large at time of discovery usually single and show a radiating crystalline structure Pure pigment stones are black or very dark green brown faceted and almost always small and multiple Hundreds may be found in one gallbladder The common mixed type which usually forms in the presence of chronic cholecystitis assumes many sizes and shapes and may occur singly or in numbers They are of many hues and on section characteristically reveal varying composition from lamina to lamina In addition to cholesterol bilirubin and calcium analysis shows variable amounts of iron phosphorus and other minerals

It is said that when stones form in the gallbladder in about 7 per cent of the cases they also form in the larger biliary branches within the liver substance It is probable that whenever cholelithiasis occurs cholecystolithiasis is or has been present At any rate the gallbladder is the site of formation for the great majority of stones and the physicochemical activity responsible for their development must be sought here The important factor seems to be a mutual solubility relationship between the bile s fatty acids cholesterol and bile salts The fatty acid concentration in normal bile is high most of it being conjugated with cholic acid This is important because fatty acids prove to be a much better solvent for cholesterol than is a solution of bile salts if the concentration of one or the other should become depressed When liver bile is formed it is alkaline and the fatty acids are in the conjugated state

come nauseated if the whole dose is swallowed at once Skipping breakfast the patient reports for films in the morning Ordinarily a large general survey film is made of the abdomen first among other things to locate the position of the gallbladder More small films are then made over the gallbladder area including at least one with the patient standing upright organ Residues of contrast material in the colon which occasionally prove a nuisance can often be moved out of the way by placing the patient erect

If all goes well the normal opacified gallbladder stands out clearly with whatever shape and in whatever position it may find itself A good shadow indicates that the gallbladder s mucosa is functioning well enough in its absorptive capacity to produce good concentration of the bile Stones and tumors appear as negative shadows Occasionally one is able to identify such tiny formations as Rokitansky Aschoff sinuses the intramural diverticula of the gallbladder The common and cystic ducts do not show when Priodax is used as the dye but in about two thirds of routine examinations made with Telepaque they do The hepatic duct does not become opaque Administration of paregoric every four hours between the time the dye is taken and the films are exposed



Fig 199 Normal cholecystographic shadow

An upright film must be routine in cholecystography in order to detect the occasional case in which the gallbladder contains but is not filled with tiny stones When the patient is supine they are obscured by the dye but when he is upright they sometimes gather in a horizontal profile line floating in a layer between the interfaces of two bile dye mixtures of differing densities (Fig 200) In addition the erect position sometimes avoids confusing superimposed bowel shadows and may improve visualization of calculous material which settles into the fundus of the

both organs The initial pain of a classic gallbladder attack is often felt high in the epigastrium and pain in the gallbladder area itself may never appear Splinting of the diaphragm as protection against aggravation may lead subjectively to dyspnea and objectively to tachypnea It is possible that not all is biliary effect for it is known in dogs that artificial distention of the gallbladder regularly depresses coronary flow In fact normally when the canine gallbladder contracts in response to natural stimuli coronary flow is momentarily decreased Amelioration of angina pectoris is occasionally observed in clinical practice following removal of a diseased gallbladder

There is no information to suggest that cholecystectomy is ever justified for the purpose of improving cardiac function The indications for cholecystectomy are local ones A serendibitous result may occasionally be improvement in some functional heart abnormality

OBJECTIVE EXAMINATION METHODS

Through laboratory and roentgenologic study it is possible to obtain a good deal of information about the function and morphologic abnormalities of the biliary tract In general, the greatest help comes from roentgenologic study following opacification by some chemical which is excreted by the liver The technics for this are remarkably simple effective and safe Examination of the bile aspirated from the duodenum has gradually become less important for clinical diagnosis but remains still a valuable procedure in a few biliary problems Hemochemical tests are helpful for study of the jaundice matter as discussed elsewhere It is the clinician s responsibility to approach these objective studies with the realization that the results do not necessarily provide a clinical diagnosis and that interpretation of the observed positive findings must be reserved in deference to the over all picture

The opportunity should never be missed to study the region of the papilla of Vater during upper gastrointestinal roentgenography With a little attention the normal major papilla can be identified in most patients at its usual position on the posteromedial aspect of the middescending duodenum When studied with the help of moderate compression the defect produced in the duodenal mucosal pattern normally measures about a centimeter in diameter with wide variations The important disease to be sought here is of course carcinoma of the papilla but in addition other tumors inflammation and extrinsic pressures are best detected by this means

ORAL CHOLECYSTOGRAPHY

Roentgenologic examination of the gallbladder and of the extrahepatic ducts is or can be all one procedure and because it can be accomplished by intravenous cholangiography it might be thought that oral cholecystography (Graham Cole test) had best be considered passé This is not so for two reasons First the clinician is often interested primarily in the gallbladder and the oral test for its visualization is simpler cheaper and safer than intravenous cholangiography It does not produce as dense a shadow ordinarily and this brings up the second reason the strange paradox of the more efficient contrast media for biliary tract visualization as better and better media are developed and their concentration by the gallbladder becomes more and more efficient the chances of gallstones being obscured become greater and greater The dyes used for intravenous cholangiography sometimes prove to be a little too strong for optimum visualization of gallstones A great many chemicals have been developed for radiopacifying the organ Those currently available for oral use seem satisfactory enough and do not need to be improved

Telepaque (iopanoic acid) is the best dye for routine oral use On the evening before the examination the patient takes a meal free of gross fat and before bed he swallows 3 gm of dye This is taken as six 0 5 gm tablets at five minute intervals with plenty of water for a few people will be

contraindication to the Graham Cole test

When the dye does not become concentrated in the gallbladder disease cannot immediately be assumed There are several artefactual reasons for failure of the technic The dye as stated may not be absorbed Because of diarrhea the tablets may be passed quickly Once in the blood stream the dye must be excreted by the liver into the bile before it leaves the body via the kidneys If there should be diffuse liver disease the gallbladder may never have a chance to handle the dye Cholecystography is after all a test of liver function It is not the presence of jaundice per se which interferes with gallbladder visualization but the over all disease For instance visualization is good in only about half of patients who have portal cirrhosis Once the contrast material has reached the bile it must be backed up into the gallbladder through the active efforts of biliary pressure If the cystic duct is blocked dye cannot enter the gallbladder

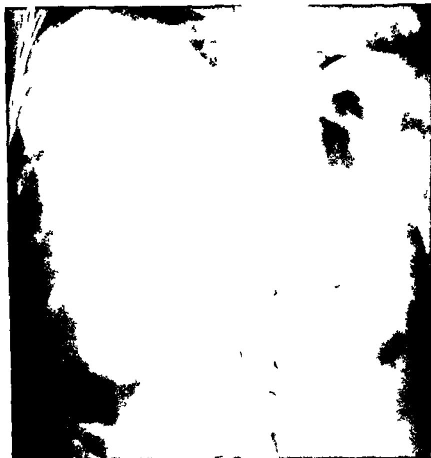


FIG 201 Cholecystographic sign of faint opacification of the gastric wall about the gastric bubble Detection of this sign proves absorption of the oral contrast medium a help in evaluating the significance of nonvisualization of the gallbladder

Furthermore the sphincter of Oddi (Gage) must be competent if there is to be enough intracholedochal pressure to fill the gallbladder If there has been a sphincterotomy without cholecystectomy in the treatment of pancreatitis for instance roentgenologic evaluation of the gallbladder by oral technic will not be satisfactory Usually the possible effects of all of these interfering factors can

assures good visualization of the ducts in most cases Most cholecystographic routines call for oral administration of a fatty drink if the initial film shows concentration in order that the gallbladder may be stimulated to contract and empty itself This constitutes a sort of test of its emptying function to add to the test of concentrating powers It is a rather unreliable measure of this how ever and does not furnish much useful in formation One notes over the country a tendency to omit the fat meal part of the technic

The iodide compounds used for cholecys tography and cholangiography are absorbed from the bowel again after being emptied from the biliary tract and eventually are excreted by the kidneys The films in cases of common duct obstruction occasionally show a pyelogram with significant dye con centration in the renal pelves There is an other interesting sign to prove that the patient has absorbed the dye tablets—often helpful information when the gallbladder fails to show up on the films—and this is the choleg raphic stomach sign If a film made during cholecystography includes the gastric fundus a doughnut shaped area of increased density is frequently found surrounding the magen blase The appearances suggest that the dye has been concentrated in the gastric mucosa showing well in the portion which is col lapsed about the gas bubble but this is not proved to be so The cholegraphic stom ach sign persists about a day (Fig 201)



Fig 200 Layering of hundreds of tiny stones which could be well dem onstrated only when the patient was examined in the upright position

In addition to nausea the oral iodide prep arations rather frequently cause diarrhea thus interfering with their absorption This is the most common untoward reaction There are others but none carry the threat of important danger Mild and transient dysuria is experienced by about a quarter of the pa tients Headache is about as common Allergic phenomena are rare Mild albuminuria some times is observed for a few days but signifi cant renal injury has not been reported with the newer dyes Nevertheless severe renal disease should most often be considered a

terestingly enough is often due to the presence of acute cholecystitis The gallbladder if it be present attains maximum opacification in about 30 minutes with wide variations At the height of dye concentration stones are often obscured and may not become visible for 24 hours After cholecystectomy the duct fills in one hour if it fills at all Abnormal bromsulfalein retention correlates well with poor visualization If it amounts to more than 30 per cent in 45 minutes there is little chance of a satisfactory study and the pyelogram is likely to be better than the cholangiogram There is considerable variation in the effect of elevated serum bilirubin content on the success of the examination Dye in the right kidney pelvis may at times confuse the picture as may superimposition of different parts of the duct system unless the films are made at the proper angle If the sphincter of Oddi remains patulous the dye may run quickly into the duodenum This can often be prevented by administering a dose of morphine which in addition to providing for maximum duct opacification may cause the dye to enter the pancreatic ducts for their visualization Dye which enters the duodenum frequently collects in the duodenal bulb Here it may assume the appearance of a gallbladder This is an important potential source of misinterpretation perhaps even suggesting a reformed gallbladder or the presence of a double gallbladder If the patient is simply given a drink of water the dye is quickly washed from the duodenum It is clear for these several reasons that the films must be developed and examined as soon as they are exposed Otherwise the possible sources of confusion or error may not be recognized until it is too late to rectify them Depending on the appearance of the first films it may occasionally be found desirable to continue exposures for as long as two hours

OPERATIVE EXPLORATION OF THE DUCTS

At the time of biliary tract surgery thorough evaluation of the common duct particularly for the presence of stones or narrowing at its distal end is not possible through mere inspection and palpation The surgeon s eyes never see even the entire outside of the common duct and the region just proximal to the papilla is very difficult to palpate especially if it runs through pancreatic tissue The usual way to obviate the difficulties is to open the duct and explore it with a probe If there is a history of jaundice most surgeons do this routinely during cholecystectomy and many believe that absence of jaundice is not reason to omit duct exploration A history of acute pancreatitis compels choledochostomy because it carries twice the chance of a common duct stone Palpation of the duct with the probe in place is made most effective if through the Kocher maneuver the duodenum is reflected for exposure of the duct s posterior surface Usually exploration is followed by insertion of a T tube and external biliary drainage for a variable period perhaps 10 days or two weeks in the average case Cholangiography must be carried out through the T tube before it is removed even though it has already been done at the time of surgery because of the possibility that stones have moved down from the hepatic duct following operation Choledochostomy for exploration increases the incidence of postoperative complications and the mortality rate a little bit

As important as direct probing of the common duct is it has certain disadvantages and operative cholangiography can make up for some (Fig 202) This procedure is being adopted as a routine in many quarters Easy passage of a probe through the ampulla is unfortunately not necessarily proof of the absence of stones and in a small proportion of cases it must be expected that a stone will be missed Furthermore local exploration may fail to give any warning if there has been surgical injury to the duct system while cholangiography will usually demonstrate it Operative cholangiography adds only a few minutes to the operative time When a T tube is to be inserted cholangiogra

be evaluated clinically and one can recognize the cases in which poor visualization is due to gallbladder disease In many instances however when the initial oral cholecystogram fails to show opacification of the organ one will choose to repeat the study with a double dose of the dye Frequently the double dose will give quite different results either because the dye was not absorbed the first time or because the organ has partial impairment of its absorptive function It must be mentioned too that a repeat examination with a single dose sometimes provides opacification after failure of filling only a few days before

A poorly evaluated physiologic cause of occasional cholecystographic error is simple cholecystic stasis If a patient has been limited to a fat free diet or has been unable to eat or to retain food the gallbladder may not have emptied for several days Consequently its contents at the time the dye is absorbed are thick because of concentration The dye then may be unable to enter the organ from the ducts If conditions prior to cholecystography suggest that physiologic stasis has occurred it is wise to give a fat meal a day ahead of time

It is an unfortunate fact that cholecystography is often unsatisfactory in infants and young children Visualization can be obtained only about half the time even though there is no disease Because of relative alacrity of dye absorption it is important in examining very young people to expose a series of films over a period of about five hours beginning four hours after the contrast material has been administered

In spite of all these problems most of which are minor the Graham Cole test is one of the most reliable objective tests in gastroenterology and one would not like to have to practice the specialty without it

INTRAVENOUS CHOLANGIOGRAPHY

Although oral Telepaque permits visualization of the common and cystic ducts in the majority of cases when the gallbladder is able to concentrate the dye intravenous cholangiography gives superior results whether the gallbladder is present or not This is a remarkably simple and effective technic which under certain conditions provides visualization of the entire biliary tree Because of the efficiency of oral cholecystography its most important use is in study of the postcholecystectomy state

Cholografin (sodium iodipamide)—the original German name was Biligrafin—is a new intravenous cholangiographic dye which has been accepted with enthusiasm by all who have put it to clinical test All but about 10 per cent is actively excreted by the liver cells within a few minutes of administration being concentrated 30 to 100 times from the blood level in the process The iodine content is 64 32 per cent and because it is firmly bound in a complex molecule it does not split off during its travels The remaining 10 per cent is excreted by the kidneys—more if there be significant hepatic disease A few instances of temporary granulocytic depression have been reported but at this moment the danger of complications does not appear to be very important In about 5 per cent of patients there are mild reactive symptoms—nausea transient dizziness trembling and restlessness

The technic of the test although simple is moderately time consuming and expensive Food and drink are withheld after midnight before the examination Although there appears to be no significant allergic threat it seems wise in using this new drug to give a small intravenous test dose first Then 40 ml of the 20 per cent solution are given intravenously over a 10 minute period For infants and children who are well studied by this technic proportionately smaller doses are used Films of the gallbladder are exposed every 10 minutes for 40 minutes beginning 10 minutes after completion of the injection The first film should be of the whole abdomen and developed immediately so that subsequent films may be coned down and properly positioned

The common duct is visualized in about 95 per cent of cases Failure of duct filling in

Overdistention of the system naturally tends to defeat the purpose by decreasing visualization There are other interpretational as well as mechanical problems involved especially inadvertent introduction of air bubbles into the ducts but even though the technic is not without its difficulties it furnishes invaluable information for the surgeon

During peritoneoscopy it is relatively easy to insert a needle into the fundus of the gallbladder aspirate its contents and to inject contrast medium for immediate x ray study The whole biliary tract may be filled by this technic and excellent cholangiograms are obtained Complications appear to be rare

BILIARY DRAINAGE

Once the primary technic for objective biliary investigation biliary drainage has become relatively unimportant because of the effectiveness of roentgenologic methods No longer does the clinician receive positive help by fractionating the contents of the biliary tract If one believes in biliary giardiasis as a valid entity he will require the diagnostic help that an aspirated bile specimen can give and in certain other clinical situations it may give supportive or supplementary information to assist a clinical decision For instance demonstration of cholesterol plus calcium bilirubinate crystals in drainage material comes close to being pathognomonic for biliary calculus and either by itself indicates stones in perhaps 75 per cent of the cases The clinician however wants much more information about stones than this and roentgenologic technics can supply it By itself biliary drainage rarely furnishes a diagnosis

The technic of biliary drainage is well known and requires little comment A Rehfus or similar type of tube is passed into the stomach the patient is placed in the right lateral position and the tube is passed on into the duodenum To the tyro this may be a frustrating job usually because he passes too much of the tube too quickly and he can only marvel at the ease and rapidity with which the experienced technician regularly accomplishes the feat Fluoroscopic help can be resorted to but should not be necessary One knows that the tube s tip is in the right place largely by the nature of the aspirate A useful quick test of position is to inject a large amount of air and by failing to recover any upon aspiration to be moderately sure the tip has reached the duodenum Drainage proceeds by simple gravity flow The sphincter of Oddi is encouraged to relax by injecting into the duodenum 30 ml of water containing 15 gm of magnesium sulfate One usually wishes to examine the aspirate microscopically and possibly to culture it There is little other practical clinical use for the material except to note its absence in obstructive jaundice

ANOMALIES

THE GALLBLADDER

Anomalies of the gallbladder are moderately common although those which actually constitute disease are very rare The problem presented is for the most part that of abnormal location and variations in arterial supply both of which may confound the cholecystectomy minded surgeon Thus the gallbladder may be completely buried in the liver substance so that at operation there may seem to be congenital absence of the organ Actual absence is rare as are rudimentary forms of the organ only about 200 cases have been described Abnormalities in position are moderately common Most are explained by the presence of a long gallbladder mesentery and these floating gallbladders may move widely through abdomen and pelvis entering hernia sacs and reaching other bizarre locations A gallbladder which is discovered in the left upper abdomen is usually associated with situs inversus but sometimes there is merely anomalous attachment to the underside of the left lobe of the liver An anomalously placed gallbladder is as prone to become infected or develop cancer as any other and the clinical confusion which may result is apparent

The most common anomaly of gallbladder

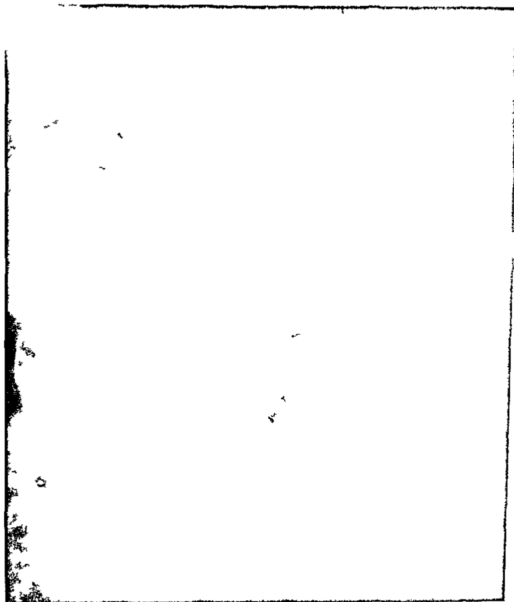


FIG 202 Operative cholangiography following insertion of catheter through small incision in wall of the common duct The duct is greatly dilated because of stricture and obstruction is almost complete

phy is carried out through it immediately after it has been put in place If the surgeon does not plan to establish T tube drainage he may for injection of the dye insert a small catheter through the cut end of the cystic duct after the gallbladder has been excised or he may make a small slit in the common duct for the purpose Direct injection of dye into the common duct with syringe and needle does not work well because of dye and bile leakage

In any case the dye is injected through the tube or catheter and films are exposed and developed immediately so the surgeon can have the information prior to completion of the operation Diodrast is a good contrast medium It may require from 15 to 50 ml to fill the duct system depending on the degree of dilatation but it is most important that the first picture be taken with only a small amount of dye so that a small stone will not be obscured by radiopacity

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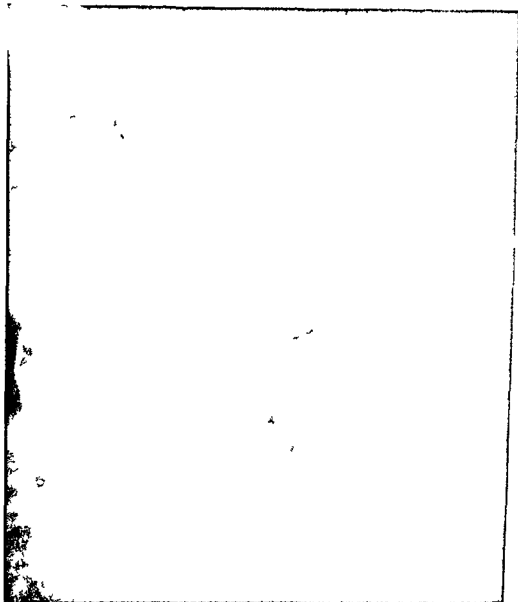


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noting that an ampulla of Vater a term which is frequently confused with papilla of Vater is present in as few as one third of all adults and at that in the majority of these the ampulla is simply a common channel rather than an actual dilatation The major papilla itself may or may not contain an extension of the common duct s terminal sphincter (Giordano s) as part of the general sphincter complex of Oddi

In other normal people the common duct and Wirsung s duct have autonomy all the way to the duodenal lumen The end of the former tapers like a funnel and its intramural segment is normally only about 2 mm in diameter

Another normal congenital ductal variation has to do with relationship between the common duct and pancreas In about one third of normal people the duct passes through the substance of the pancreas just before it enters the duodenal wall In about one third it remains extrapancreatic all the way and in the rest it is incompletely surrounded by pancreas

Major anatomic variations in the course of the extrahepatic ducts can be of as much or more concern to the surgeon than variations in the local arterial pattern even though they are much less common Sometimes the ducts are reduplicated The common duct may enter a duodenal diverticulum or empty into the stomach The terminus of the cystic duct is occasionally the right hepatic duct or there may be two or three cystic ducts each emptying into a different part of the system This type of anomaly does not prove of importance until a surgeon starts to work in the area

Congenital malformations of the duct system are of serious import if they include atresia Prognosis depends largely on the location and extent of atretic areas and the difficulties encountered in establishing an early diagnosis Congenital atresia of the extrahepatic ducts occurs about once per 20 000 live births Affected babies are usually born at term and except for jaundice appear normal Associated anomalies are not particularly common Growth is very slow If the obstruction is not relieved surgically death ordinarily comes in about seven months although an occasional baby lives into the second year In cases of neonatal jaundice if clinical hematologic and biochemical studies point to an obstructive basis surgical exploration is almost always indicated and without delay Needle biopsy of the liver may give important information for both preoperative diagnosis and evaluation of secondary hepatic injury neonatality is no contraindication to liver biopsy nor is the information obtained less useful than it is in the adult One may wish to carry out intravenous cholangiography during the initial study but in neonates nonvisualization cannot necessarily be considered indicative of duct obstruction or atresia even though liver function may seem well compensated The number of atretic cases which are amenable to surgical correction is small and in those which are the technical problems involved are very difficult Hepatojejunostomy is necessary in most instances

CONGENITAL CYSTIC MALFORMATION OF THE COMMON DUCT

Congenital cystic malformation of the common duct is a disease of the postinfancy period which results from partial congenital obstruction at the termination of the common duct with gradual dilatation proximally It is to be distinguished from simple fusiform ductal enlargement secondary to acquired stricture The lesion is a dilatation rather than a cyst analogous morphologically to a saccular aneurysm It transmits bile in adequate amounts to maintain relative health for at least a few years in most cases Among the 200 or so cases which have been described the diagnosis was made in about half during childhood and in the rest during adolescence or early adulthood About 80 per cent of the affected people are females Difficult to identify with certainty the obstructing factor in most instances seems to be explained by either congenital underdevelopment of the duct s end simple kinking or the presence of a tiny mucosal valve Usually the

structure is the Phrygian cap which is encountered in about 5 per cent of people studied roentgenologically It has no clinical significance being merely a radiologic abnormality (Fig 81) Named, it is said for the headgear favored by that ancient Hellespontine nation it looks like a little folding of the gallbladder fundus on itself It is due *either to a narrow congenital* band which runs around the medial aspect of the organ or more commonly to a persisting narrow internal septum which forms a permanent incisura

Double gallbladder although rare has been reported in several anatomic forms It is frequently associated with congenital anomalies elsewhere in the body True duplication with two cystic ducts is the usual type Less commonly *there is only a single duct with a* bilobed fundus There may be partial subdivision by a longitudinal septum or a second organ may protrude like a diverticulum from the wall of the main gallbladder When there is complete duplication usually one member concentrates cholecystographic contrast *medium better than the other* and there is danger of overlooking the fainter shadow Many problems may be created in interpretation and surgical treatment but fortunately double gallbladder shows no special tendency to cause trouble

Other anomalous forms are not common Spherical gallbladder is more of a roentgenologic than anatomic variation It has no relationship to body habitus Congenital bands and membranes are rather common in this area and may deform the organ Cholecystoduodenocolic membranes sometimes fix the fundus against the duodenum causing distortion of the latter without producing symptoms

Aberrant gastric and pancreatic glandular rests are occasionally found in the gallbladder mucosa They seldom become important except as a site of erosion and bleeding

ACUTE *TORSION OF THE* GALLBLADDER

For acute torsion to occur there must be one of two gallbladder variants either the organ must be completely peritonealized and free of attachments *or its fundus must be* peritonealized and the rest of the organ must have a mesentery Sometimes one member of a double gallbladder hangs free and is then able to undergo axial rotation Most cases of torsion occur in tall thin 60 to 80 year old women The condition has been reported in preadolescents but is rare before middle life Predilection for women is marked

There is no typical clinical picture It is that of an acute abdominal catastrophe rather well localized to the gallbladder area At the start there are no systemic or toxic manifestations but only pain and tenderness Quickly however gangrene and rupture may lead to more generalized manifestations The need for emergency surgical help is apparent *usually the diagnosis must be made at the* time of operation Cholecystectomy is always indicated however viable the organ may appear to be following its reduction

DUCT SYSTEM

Individual congenital variations in the *terminus of the common duct although in*consequential of themselves could possibly play a part in governing mutual exchange of secretions between the biliary and pancreatic duct systems In some people it is sometimes said reflux of bile into the pancreatic ducts is potentially able to initiate pancreatitis and *whatever control the pressure gradient may* have over the process anatomic arrangements in about 30 per cent of normal people seem to make reflux possible In these people the main pancreatic duct of Wirsung joins the common duct in a common channel the ampulla of Vater prior to their joint discharge *through the major duodenal papilla* (papilla of Vater) It is anatomically possible therefore for material from the common duct to enter the duct of Wirsung through the ampulla although physiologically this may seem quite improbable In the dead specimen the ampulla of Vater is only about 4 mm *long It always* lies within the intramural segment of the duct as the duct obliquely traverses the duodenal wall It is well worth

udation and exudation through an edematous mucosa into the lumen of the organ Disten tion rapidly develops and the two main effects of pressure are interference with venous out flow and erosion of the mucosa Intramural hemorrhage follows The serosa reacts by fibrinous exudation For the full process to develop either bacterial or chemical action must enter the picture at this point With the intervention of acute inflammation the me chanical problems become more severe In creasing distention may produce enough venous blockage so that mural necrosis re sults The final stage is gangrene of scattered areas of the gallbladder wall with perforation

Empyema develops if the contents of the obstructed gallbladder become actively in fected by pyogenic bacteria True empyema is an unusual departure from the ordinary progress of events and again it must be emphasized that infection and acute inflam matory response are not the major features of acute cholecystitis *Hydrops* is in a sense the reverse of empyema Here the contents of the obstructed gallbladder remain very bland causing no bacterial or chemical irritation of the organ s wall More important vascular in tegrity remains intact In spite of persisting obstruction the gallbladder wall is not seri ously damaged Continuous transudation causes unrelenting distention and eventually the gallbladder may become very large It may eventually undergo calcification

At any point during the course of acute cholecystitis the process may undergo spon taneous resolution The reason is usually not determinable but it is necessary to assume that relief from obstruction is a prerequisite Perhaps with distention the stone either rolls away or passes on through the duct Ordi narily if the pressure has not been great enough to obstruct the circulation inflam mation begins to subside after about three days

GANGRENE AND PERFORATION

Perforation a complication of delayed treatment is a potential threat in all cases of acute cholecystitis It is encountered in about 0 3 per cent of routine general hospital autopsies and in about 20 per cent of patients who are operated upon during the acute stage of acute cholecystitis It has been reported in newborns Perforation may occur as soon as 24 hours after onset of the first symptom but ordinarily six or eight days elapse In the majority of cases perforation is subacute and is locally contained by pericholecystic ad hesions as an acute abscess Sometimes there is quick extension of the infection through the subphrenic and subhepatic areas in the ab sence of free peritonitis Less commonly per foration leads quickly to formation of an internal fi tula usually cholecystoduodenal or cholecystoenteric and occasionally cholecysto colic Free rupture with spreading peritonitis is rather unusual occurring in approximately 6 per cent of all cases It is of course a very dangerous complication the mortality rate being in the neighborhood of 40 per cent whatever form treatment may take Occasion ally perforation of an acutely inflamed gall b adder leads to massive intraperitoneal hem orrhage The prognosis then becomes excep tionally poor not only because the diagnostic features may be obscure and lead to operative delay but also because this situation creates notoriously difficult technical prob ems for the surgeon

Transmural gangrene is the process respon sible for perforation It is found already to be present through at least restricted areas of the wall in about one quarter of patients with acute cholecystitis who are managed surgically There appears to be no sex pre disposition but the risk rises appreciably as age advances The injury is largely vascular There is plethoric stasis secondary to venous compression and the natural consequences are thrombosis and hemorrhage Histopath ologically no important degree of inflam matory reaction is found in half the cases

CLINICAL ASPECTS

The important symptom of acute cholecysti tis is pain The trigger zone for initiation of gallbladder pain through stone impaction is the opening of the cystic duct or farther along in the duct in the region of Heister s (Amussat s) valves Ordinarily the onset is

gallbladder and cystic duct above the dilata tion remain contracted and functionless The intrahepatic ducts on the other hand usually are normal The cyst grows gradually in *exceptional cases attaining a tremendous size* with a capacity perhaps exceeding 5 liters Its wall sometimes becomes thinned as time goes on but usually it grows thick with fibrosis The mucosa usually is lost early in the course of dilatation

Symptoms may persist or recur in mild form for several years before the patient or the parents seek an explanation and treat ment They depend on the degree of obstruc tion which is chronic but only partial or intermittent Pain in the right upper abdomi nal quadrant is the main problem It has the characteristics of biliary tract pain but once *it appears it tends in most cases to persist* for many days at a time Large meals and pressure over the area tend to aggravate it About three quarters of the patients have persistent low grade fluctuating jaundice and most of the rest give a history of jaundice at some time in the past A distinct mass can be palpated below the right lobe of the liver in about three quarters of the patients at the time they are first examined Occasionally the retained material in the cyst becomes infected whereupon the features of a pyo genic abscess become superimposed on the chronic picture Roentgenologic examination confirms the presence and location of the mass but it is not possible to opacify it by cholangiography Precise anatomic diagnosis must wait until surgical exploration

Treatment calls for operative relief of the obstruction Many procedures have been sug gested but some form of cystoduodenostomy with or without partial cystectomy seems to work best Among reported cases the opera tive mortality rate has been very high but one cannot afford to temporize by nonsur gical measures once the disease has been identified

ACUTE CHOLECYSTITIS

This basic form of gallbladder disease ac counts for about 25 per cent of all biliary problems among general hospital admissions It is a disease largely of middle life but oc casionally it is encountered in children as young as 7 years old and in very old people The average age at the time of the first attack *is about 45* years Because of its close asso ciation with gallstones it is no surprise that women predominate in a proportion of about three to one

PATHOLOGIC ASPECTS

Acute cholecystitis is primarily more of an acute obstruction than an inflammation The three important factors found in most gall bladder disease—stones obstruction and in fection—are at work here With few excep tions—possibly 5 per cent—the disease in adults begins with obstruction of the cystic duct by impaction of a stone at the gallblad *ders neck This is not true of the acute* cholecystitis of very young people who are more likely than adults to have some acute systemic infection such as scarlet fever as the apparent initiating factor Although pri mary bacterial infection of the gallbladder has a very doubtful etiologic status in the adult it is to be noted that certain systemic infections especially typhoid fever are rather often complicated by acute cholecystitis The specific organisms are present in the gallblad der wall in such cases of course but it may be that stasis and inspissation of gallbladder contents aggravated by failure to eat during the acute phase are at least partially respon sible for development of the acute process It is believed that acute angulation of the duct leads to obstruction in an occasional case and that rarely reflux of pancreatic juice is able to cause acute mucosal edema and ductal block One always feels a certain insecurity over the possibility that allergic processes are able to cause acute obstruction of such gastro intestinal diverticula as the gallbladder and appendix but for clinical thinking it seems best to discount this ephemeral factor lest the unsuspected gallstone receive less than primary attention

Although bacterial action is ordinarily far from a primary process in acute cholecystitis it becomes prominent after two or three days have passed First obstruction leads to trans

The serum amylase may show a similar rise It is probable that a little bleeding occurs into the bowel in many cases of acute cholecystitis and this may be enough to give a positive stool test for occult blood Seldom does one have the inclination to carry out cholecystography under the conditions which are encountered in this disease *It is not a* useful test here but if it should be done there will of course be no opacification of the organ On the other hand a plain film of the abdomen so important in every case of acute abdominal pain may give information regarding the size and location of the gall bladder and in addition will show stones which happen to be radiopaque

TREATMENT

Acute cholecystitis either subsides be nignly on simple medical management or suddenly becomes an acute surgical emer gency There is no way to predict which course a case will follow and this is the enigma of acute cholecystitis therapy The spectrum of opinion over proper routine therapy is—quite fortunately for progress it must be admitted—a wide one but the con sensus of the best experience indicates with only a little reservation that emergency chol ecystectomy is the proper treatment Perhaps the gastroenterologist s experience is mislead ing in that he encounters an unfair propor tion of cases which have been complicated through overzealous conservation but he is likely to be a staunch supporter of early oper ation as the best approach for most cases

Individualization of patients for operation is as important in acute cholecystitis as it is in other abdominal problems The danger of delayed action is perforation and the de cision regarding the proper time for opera tion depends largely on this The main factor to be considered is the estimated stage of the disease at the time the patient is first ex amined The patient s age and the presence of coexistent disease are relatively important It is sometimes said that the safest time to operate is between 6 and 24 hours after onset of symptoms and that if 72 hours have passed and the clinical situation suggests spontane ous remission it is best to wait out the epi sode The trouble with this precise rule is that it may be impossible to tell when the trouble began Many experienced surgeons prefer total individualization of each patient s problem with total disregard for the duration *of illness More believe it a good rule to sup* pose that after an estimated three days local reaction and edema of the tissues will make the operation more hazardous than the bene fits to accrue

The operation of choice is cholecystectomy and this can almost always be done Surgical pride does not suffer however if simple cholecystostomy is necessitated by the condi tion of the tissues patient s response to anesthesia discovery of concurrent acute pancreatitis or some other deterring situation discovered at the time of operation Usually the main consideration is fear of common duct injury because of obliteration of the normal surgical landmarks by edema and in flammation The important area of Calot s triangle (base is cystic artery and apex is the angle formed by the junction of the cystic and hepatic ducts) may be entirely obscured Postoperatively the course is usually an ex ceedingly easy one and if the gallbladder has been removed cure has been accomplished

Usually the history of an attack of acute cholecystitis in the past is an indication for cholecystectomy at some point in the patient s course If the gallbladder is not removed dur ing the acute phase it should in most cases be removed as an interval procedure about two months later As a general rule all truly symptomatic biliary disease which involves stones is best treated surgically because even though most stone cases remain entirely healthy and need no treatment at all once periodic troubles begin they usually continue until definitive therapy is accomplished In the case of acute cholecystitis the dangers inherent in interval cholecystectomy rise sig nificantly after each acute episode

If conservative treatment is chosen as proper for the acute phase of the illness the chances are good that with simple support

fairly rapid and the intensity progressive but sometimes the history suggests a few false starts a week or two ahead of time For this reason at the onset it may be difficult to differentiate acute cholecystitis from uncomplicated gallbladder colic or acute nonobstructive symptomatic episodes in the course of chronic cholecystitis But in the majority of cases the pain continues with progressive intensity once it begins At first it is usually located centrally in the epigastrium but rather soon it moves to the right upper quadrant It is sharp pain with an irregular colicky quality Radiation to the right shoulder is common Although during the first two or three days the pain may be very severe thereafter it tends to subside This may mean that the process is clearing or it may indicate that there has been progression to gangrene and imminent perforation The disappearance of clinical manifestations with the onset of gangrene in elderly people especially is noteworthy Meanwhile most patients have some nausea and vomiting the result of cholecystic distention with stimulation of the cholecystogastric reflex

The important local physical findings are tenderness spasm and palpability of the distended gallbladder Tenderness is often exquisite rendering search for a mass impossible If the patient is able to inhale deeply pushing his liver and gallbladder down against the examiner s fingers the tenderness is brought out well (Naunyn s sign) During an acute episode however there is relative fixation of the right diaphragmatic leaf through reflex splinting in about three quarters of the patients Demonstration of fixation is a helpful sign Even though muscle guarding and true spasm interfere in about half the cases a tender mass can be found in the gallbladder area It is sometimes said that in women the distended gallbladder points in the direction of the umbilicus and in men towards the flank but this is difficult to demonstrate After the onset of gangrene the mass is likely to become less distinct apparently because of pericholecystic reaction A peritoneal friction rub is infrequently demonstrable because of diaphragmatic splinting

Systemically tachycardia fever variable prostration and the other less specific manifestations of any acute inflammation are found If there are chills one can assume an associated cholangitis

A cholangitis reaction out in the main biliary ducts is an interesting and moderately frequent part of the picture of acute cholecystitis In fact it is not unusual at first to be impressed with the possibility of primary common duct disease The mechanism appears to be simple extension of edema to the common duct with partial or temporarily complete obstruction The result is jaundice of some degree in about one third of the patients It is necessary of course to keep in mind the not inconsequential possibility that there is an associated common duct stone

If as is usual acute cholecystitis begins to resolve after the third or fourth day has passed the systemic effects clear quickly Even after pain has gone however residual tenderness persists over the gallbladder and this is a very characteristic feature of the disease If perforation becomes imminent the same clinical course may be followed for a few days but often there is then some hint of the impending problem This usually takes the form of sustained pain and progression of the systemic reaction

Objective studies are not especially helpful for diagnosis but regularly have an important function in evaluation of the course especially during apparent resolution of the disease Mild leukocytosis is usually found after a day or so have passed Even after gangrene has developed however the leukocyte count may be normal and among elderly people especially emphasis on this test can be most misleading The erythrocyte sedimentation rate gives a much better idea of the course of the pathologic process The results of daily sedimentation rates during the period when the patient is beginning to feel better may give warning of progression to gangrene The serum bilirubin level commonly shows slight elevation on the third or fourth day of illness

have choledocholithiasis as judged from surgical and autopsy experience Naturally the incidence of common duct stone observed at operation for cholecystolithiasis is considerably higher than that found at autopsy where there is no discrimination between silent and clinically important stones It is interesting that even at operation no more than two thirds of the patients who are found to have common duct stone have jaundice or give a history of jaundice

Chronic cholecystitis is not an infectious process although once the gallbladder wall has become diseased and emptying inefficient superficial bacterial infection can become established with a little difficulty The presence of infection has no effect on the clinical course unless the gallbladder should become obstructed Cultures taken at operation from the gallbladder contents in uncomplicated chronic cholecystitis demonstrate viable organisms in about a quarter of the cases usually *Escherichia coli* or a related form *Salmonella* spp and *Streptococcus* spp are less common

The histopathology of chronic cholecystitis does not appear to be very complicated The most important cholecystic response to injury is fibrosis Heavy fibrosis may develop throughout the mucosa and the other mural layers and the result is inefficiency of both absorptive and muscular activities Occasionally shrinkage later converts the organ to a small fibrous diverticulum Diffuse calcification of the wall is rare (porcelain gallbladder) The mucosa may in time become completely destroyed but more often at the time of operation it shows injury which is more spotty with scattered erosions in different stages of repair edema interstitial hemorrhage and a variable degree of chronic inflammatory exudate Lymphocytes and plasma cells predominate In some cases areas of epithelial hyperplasia are prominent Rather often chronically inflamed Rokitansky Aschoff sinuses can be identified Areas of mucosal infarction are not rare when stones are present

Cholecystoenteric fistula sometimes a complication of chronic cholecystitis with stones is discussed in the chapter on duodenal disease and its dangerous sequel gallstone obstruction of the small intestine is mentioned among small intestinal diseases

CLINICAL ASPECTS

Although a great deal more chronic cholecystitis is found at autopsy than is ever known about during life this disease is one of the important sources of human misery Chronic cholecystitis which is accompanied by cholecystolithiasis is a far more potent source of illness than the noncalculous variety This is largely due of course to the complications which gallstones may cause but in addition the mere presence of stones seems to intensify the homely symptoms of biliary disease when chronic inflammation is the primary process This potentiation of subjective manifestations is actually a mutual phenomenon because it is commonly observed that cholecystolithiasis without cholecystitis is a subclinical condition un ess some stone complication develops

Diagnosis of chronic cholecystitis with or without gallstones is often very difficult on the basis of the signs and symptoms alone and it must always be supported by confirmatory roentgenologic information The clinical roentgenologic balance must be maintained however as unreliable as the clinical impression may sometimes be there is danger in automatic acceptance of objectively demonstrated gallbladder disease as the explanation for the patient s problem In women particularly emotional dyspepsias are notorious for their simulation of biliary symptoms In women too gastric and duodenal ulcers often act like chronic gallbladder disease—and in men gallbladder disease often acts like ulcer The point seems to be once again that chronic visceral diseases of the upper abdomen produce symptoms in common because these symptoms are due to widespread neuromuscular dysrhythmias not to any precise local effect of the pathologic abnormality itself

When chronic cholecystitis becomes a source of illness the most important symp-

the process will subside spontaneously *Continuous gastric aspiration* with parenteral replacement of fluids and electrolytes is important both for patient comfort and for keeping the stomach away from the region of acute reaction *Antimicrobial drugs* are used in the hope of discouraging secondary bacterial invasion of the gallbladder wall and contents An anticholinergic drug parenterally administered *may* help some *patients* but for the most part it is difficult to detect any particular benefit Opiates should not be used because of their influence over the biliary sphincters Rather than analgesics it is usually better to give sedatives for pain and restlessness

ACUTE PNEUMOCHOLECYSTITIS

This rather rare variety of acute cholecystitis is due to infection with gas forming bacteria following obstruction of the organ usually by a stone It most often develops in people who are in the sixth or seventh decade and it seems especially significant that about one quarter of the reported cases have occurred in diabetics Sometimes no bacterial agent can be recovered from the purulent gallbladder contents and sometimes the responsible organism is found to be *Clostridium welchii* or *Escherichia coli* Clinically the disease acts very much like ordinary acute cholecystitis and treatment is the same but necrosis and perforation are more common and the prognosis considerably poorer

The distinguishing feature is gas within the lumen of the gallbladder and scattered as bubbles through the wall This is easily detected roentgenologically and a plain film of the abdomen gives the diagnosis

CHRONIC CHOLECYSTITIS AND CHOLECYSTOLITHIASIS

Most gallbladder disease is chronic and much is secondary to or leads to formation of *gallstones* By the time people in this country die about half have some degree of chronic cholecystitis women having a higher incidence than men When chronic cholecystitis becomes a source of subjective illness it usually does so when the patient is between 40 and 55 years of age Chronic cholecystitis occurs in children but this can be considered rare About two thirds of patients made sick by chronic cholecystitis are women

In most people with gallstones the stones *remain silent* They owe their silence to having been formed in and remaining in the insensitive area of the gallbladder The sensitive area begins up in the organ s neck at the *orifice of the cystic duct Stimulation here is* capable of causing cholecystic dyskinesia and thereby pain and of course blockage here is the factor responsible for initiation of acute cholecystitis While in the fundus stones may irritate the already diseased mucosa but they do little more Not often during life does anyone know about the presence of truly silent stones and the high autopsy incidence is a matter of continuous surprise to the clinician

PATHOLOGIC ASPECTS

Although in many cases the chronically inflamed gallbladder contains stones one must think of this disease complex in three pathologic categories although clinical distinctions may be vague chronic cholecystitis *without stones either because none has* formed or because the organ has emptied itself of its stones cholecystolithiasis without a significant degree of cholecystitis and combined stones and chronic inflammation About two thirds of gallbladders which contain one or more stones greater than 2 cm in diameter are found at autopsy to show chronic cholecystitis while only about one quarter of those containing smaller stones show chronic pathologic changes It seems significant in thinking about clinical implications that three quarters of surgically resected gallbladders which are *chronically inflamed also contain* stones

Chronic cholecystitis may become an acute problem at any time through impaction of a stone in the neck and development of acute cholecystitis The feeding of stones into the common duct leads to the second important complication common duct obstruction if they become arrested there From 7 to 25 per cent of people with *cholecystolithiasis*

symptoms which could be due to such disease If there were an effective way of doing this most postcholecystectomy problems would be dissipated But there is not and unfortunately a clinical attitude of skepticism can do as much harm as one of gullibility

Chance detection of cholecystolithiasis in the absence of symptoms— silent gallstones" —is not a proper indication for cholecystectomy Surgeons who do not agree with this statement cite as their reason prophylaxis against both the complications which such stones may later cause and the possibility that the cholecystic disease may eventually become responsible for symptoms It is quite natural that both internist and surgeon should acquire a somewhat distorted impression of the over all importance of gallstones To the internist, the important consideration is that gallstones are so commonly found at autopsy and gallstone disease is relatively so scarce in the population as a whole that prophylactic cholecystectomy for silent stones amounts to substitution of a real operation risk and postoperative morbidity problem for a slight gallstone complication risk

The indications for surgical treatment of chronic cholecystitis are illness ascribable to the gallbladder itself and evidence past or present that stones have passed into the common duct When the indications for cholecystectomy exist advanced patient age should be considered only a minor deterrent old people usually meet the stress of operation with efficient defenses which is probably why they have gotten to be old people Cholecystectomy is the procedure of choice and can usually be accomplished When for any reason it cannot cholecystotomy with removal of stones is justifiable therapy Although stones reform in such cases this usually requires a few years and meanwhile the patient has been helped

Postoperatively the patient should eat a normal diet and in fact should feel no medical restrictions at all Bile flow is continuous for a while but there is enough to handle three daily meals effectively As time goes on there is partial re-establishment of intermittent flow from the common duct

Medical measures offer the patient with symptomatic chronic cholecystitis very little They should seldom be used as more than a carry-over gesture until surgery can be arranged and at that a degree of symptomatic benefit is the most that can be expected There are no drugs which will improve the disease in the gallbladder wall cause the stones to disappear or prevent stone complications Theoretically one would like the patient to include a liberal amount of fat in his diet so that his diseased gallbladder is encouraged to empty itself at least three times a day If the patient is able to tolerate fat well—and many are—it should not be restricted There is no danger in this and if the gallbladder is able to contract with some efficiency stasis may be prevented and possibly further lithogenesis discouraged It is not clear what factors cause migration of stones from the silent cholecystic area to the cystic duct orifice but there is nothing to indicate that normal physiologic activity is responsible If the patient is not able to tolerate fat he must omit it even though the organic cholecystic disease may theoretically be aggravated thereby Antispasmodic drugs and mild sedation help a little bit as a temporary measure but they furnish no definitive answer for a chronic disease Bile salts are not used very much any more for treatment of this disease nor is "therapeutic" biliary drainage by duodenal tube

ACQUIRED DIVERTICULA

Acquired diverticula of the gallbladder like those elsewhere in the gastrointestinal tract appear to form in response to abnormal pressure secondary to neuromuscular dysrhythmia Unlike the others however those of the gallbladder almost always are found in association with mural inflammation and this places them in a special category Because chronic inflammation of the gallbladder wall interferes with its muscular activities the diverticulogenic pressures must be assisted by rather marked focal weakness of the wall This is accounted for by the sequels of inflammation There is in a sense chronic diverticulitis in all cases being part of the

tom is pain At least 90 per cent of patients complain of it Many varieties are encountered When stones are present in the diseased organ colic is most common An episode of gallbladder colic may not be followed by another for 10 or 15 years but if a few attacks come at short intervals they can be expected to continue until treatment is carried out Because cystic duct obstruction and development of acute cholecystitis is one of the common complications of chronic cholecystitis the pain of acute cholecystitis can be expected from time to time in addition however the pain of the uncomplicated chronic process is able to simulate that of acute cholecystitis closely It is important to note too that gallbladder colic is not necessarily dependent on the presence of stones nevertheless pain in the absence of stones is characteristically persistent dull and vague There is associated nausea and flatulence so often that the patient usually has difficulty describing the precise location of his pain Often the right upper abdominal quadrant is the site of maximum discomfort but it may be centrally located or referred to the back Back pain as an isolated symptom is not a rare manifestation of chronic cholecystitis In the absence of pericholecystitis of considerable activity shoulder pain is unusual

Excess stomach gas nausea and vomiting are complaints of about half the patients as they are of patients with most types of upper abdominal disease The highly publicized symptom of fat intolerance in patients with chronic cholecystitis is applicable enough but it is so common in people with ulcer cancer and in fact any upper gastrointestinal disease that it does not have much diagnostic significance By the time patients with chronic cholecystitis and stones first seek help a rather large proportion may already have experienced an episode of obstructive jaundice This will depend to some extent on the general stoicism of one s patient population but it may be fair to say that 15 per cent of patients either do not inquire into the nature of their symptoms until jaundice appears or develop calculous obstruction of the common duct as the first manifestation of their gall bladder disease

In the absence of a stone complication such as cystic or common duct obstruction physical examination is not likely to be especially helpful Some chronic cholecystitis patients are fat—perhaps one third—but some are thin and there is no characteristic gallbladder habitus as it is sometimes said Often there is tenderness over the gallbladder area but this is difficult to distinguish from the discomfort which is felt by some normal people whenever the area is pressed

Much diagnostic if not interpretational reliance must be placed on cholecystography When there is a significant degree of chronic cholecystitis the gallbladder is not able to concentrate the cholecystographic dye well enough to permit visualization The several technical and physiologic explanations for failure of gallbladder opacification which have already been mentioned contribute only a minor source of annoyance in evaluating gallbladder function but they must always be considered carefully when there is no visualization Detection of stones ordinarily requires some degree of dye concentration within the gallbladder because of the low rate of stone radiopacity As a rule one can assume that cholecystolithiasis exists in about 80 per cent of gallbladders which fail to visualize upon repeated cholecystographic efforts Although objective diagnostic accuracy suffers when chronic cholecystitis is severe experience from many centers indicates that cholecystography will mislead over all diagnostic efforts and surgical therapy in only about 5 per cent of cases of chronic cholecystitis whether or not there are gall stones

TREATMENT

There is only one satisfactory means of treating either symptomatic noncalculous chronic cholecystitis or symptomatic cholecystolithiasis and that is by surgical extirpation of the gallbladder By far the most difficult clinical decision concerns establishment of cause and effect when gallbladder disease is demonstrated in the patient who has

is a complication In the majority of cases the condition is discovered at autopsy When cholesterosis is found in a surgical specimen there usually is also some more important disease to be diagnosed

BILIARY GIARDIASIS

French gastroenterologists have written much about giardiasis of the gallbladder and biliary ducts sometimes presenting it as an important clinical disease It is remarkable that biliary giardiasis has created so little interest in this country for it appears to be a valid a beit rare and mild entity *Giardia lamblia* infection of the duodenum is as has already been pointed out common The organisms seem to thrive in this region of physiologic acid alkali extremes Bile appears to be a favorable although not necessarily a favored medium for their existence Rather frequently bile obtained by biliary drainage contains the trophozoites sometimes actively motile sometimes inactive Some of the organisms are no doubt from the duodenum but in many cases it is clear they have come down from the biliary tract That the organisms may migrate upward from the duodenum via the common duct is well established

G lamblia is not a tissue invader and if it can be responsible for disease it must act through irritation of the mucosal surface Irritation as used here is a vague term indeed but presumably it implies some action sufficient to stimulate surface edema and excess mucus secretion If biliary infection is common clinically significant irritation is not Occasionally however symptoms may result Just how far the clinical manifestations may progress is not clear because the presence of other disease can seldom be excluded There may be temporary occlusion of the ducts and biliary dyskinesias of various sorts Tissue is not actually damaged but perhaps some degree of inflammatory response may result The very point which makes it difficult to learn more about the pathology of the infection is the one which tells most about the usual clinical significance rarely does cholecystectomy reveal a gallbladder with giardiasis without other important disease

A diagnosis of biliary giardiasis can be made only by microscopic examination of material obtained by biliary drainage Evaluation of the clinical significance of a positive examination may be a difficult matter Many clinicians have given up routine biliary drainage and do not have to face this problem and it must be admitted perhaps not much is lost thereby If there should be no other interfering disease cholecystography will be normal When the clinical decision is to carry out specific therapy the regimen suggested for treatment of duodenal giardiasis will be found effective

CHOLEDOCHOLITHIASIS AND COMMON DUCT OBSTRUCTION

It seems probable that stones fairly frequently pass from the gallbladder through the common duct into the duodenum In the majority of instances the patient is unaware of the event and perhaps the only evidence that the doctor notices if the conditions should be most fortuitous is decrease in the apparent number of stones in the gallbladder or actual disappearance of cholecystolithiasis Some experienced clinicians believe that chronic cholecystitis rarely develops in the absence of stones and that discovery of noncalculous chronic cholecystitis merely indicates that the stones have already been passed One of the most impressive proofs of silence among the majority of common duct stones is furnished by a common surgical experience one or more common duct stones are found by probing in about 20 per cent of patients with cholecystolithiasis even though clinically few have duct manifestations In a portion of the patients no doubt the stones were formed up in the intrahepatic ducts but the great majority are of cholecystic origin

PHYSIOLOGIC ASPECTS

Under the conditions which exist at laparotomy the pressure within the normal common bile duct reaches levels of about 120

chronic cholecystitis Acute diverticulitis apparently does not occur or if it does it is merely a part of acute cholecystitis which becomes superimposed on the chronic process Ordinarily the diverticulum includes no muscle layer

Cholecystic diverticula usually occur singly and originate in the fundal half of the organ It is not uncommon to find a stone impacted within the pouch possibly furnishing an explanation for the local mural weakness The rest of the gallbladder usually shows the familiar type of chronic cholecystitis The clinical significance of acquired cholecystic diverticula is the same as that of the underlying disease Diagnosis is ordinarily made only at operation or autopsy Roentgenologic demonstration of these lesions is notoriously difficult either because they are filled by a stone or because the gallbladder which contains a diverticulum is too diseased to concentrate contrast material

Rokitansky Aschoff sinuses are diverticular processes which remain entirely intramural They are probably abnormal structures in all cases it is generally believed although there is not necessarily any connection with chronic inflammation The mere factor of incidence distribution brings most to light during histopathologic examination of gallbladders with chronic cholecystitis Occurring as groups of several or many tiny mucosa lined sinus tracts which burrow through the muscularis they often are associated with great thickening of the gallbladder wall and occasionally much of the wall is replaced by diverticular cysts which are easily visible to the unaided eye This is sometimes known as chronic cystic cholecystitis Demonstration of Rokitansky Aschoff sinuses during cholecystography is somewhat unusual because of failure of cholecystic opacification The roentgen sign is the appearance of small pyriform or spicular projections along the cholecystic profile

CHOLESTEROSIS OF THE GALLBLADDER

This pathologically distinct form of chronic gallbladder disease does *not have an inflammatory basis* Chronic cholecystitis is found histopathologically in only about 15 per cent of the cases The autopsy incidence among adults is about 8 or 10 per cent which designates it as one of the more common gastroenterologic abnormalities Unlike most biliary problems it is not found as often in women as it is in men When cholesterosis is diagnosed during life the patient is usually more than 40 years old Approximately 10 per cent of the cases occur in diabetics Rather frequently at autopsy some degree of pancreatic fibrosis is found a though overt disease of the exocrine activity of the pancreas is uncommonly recognized during life There is no relationship of cholesterosis to coronary artery disease and no more liver disease is found among cholesterosis patients than among the general population It is important to note especially that the patient with cholesterosis is no more likely to develop gallstones than the general run of the population Carcinoma of the gallbladder is a rare complication

The cholesterol level in the bile is usually high and this appears to be a factor in etiology Biliary drainage usually contains large numbers of cholesterol crystals The plasma cho'esterol level however is normal there is no relationship between the bile and blood cholesterol levels

Pathologically both diffuse and papillary forms of cholesterosis occur The former is characterized grossly by a congested mucosa peppered with tiny yellow superficial deposits (strawberry gallbladder) In the papillary form the deposits are concentrated into fewer larger masses sometimes with development of actual cholesterolatomas In either case both the epithelium and subepithelial tissues are infiltrated with lipoid material The mucosa is hyperplastic and the villi are characteristically thick and elongated

There are no characteristic clinical features because no illness is produced unless there is *a complication or an associated disease* such as gallstones or chronic cholecystitis There is very little disturbance of gallbladder function Cholecystography is normal unless there

which exist during impaction are very difficult to determine

In two thirds of the cases only one stone is found in the duct It may completely obstruct incompletely obstruct or act as a ball valve Only about 10 per cent of common duct stones which are recognized produce complete obstruction which makes the obstructive propensity of stones rather unimpressive Complete obstruction is often only temporary at that due to loosening of the offending stone by dilatation of the duct above it With prolonged impaction mucosal ulceration occurs about the stone An internal fistula may be the result If a sinus tract reaches the pancreas which is so close by pancreatitis may develop Progression to suppurative cholangitis and eventually to liver abscesses which are discussed elsewhere are threats whenever there is prolonged common duct obstruction

CAUSES OF OBSTRUCTION OTHER THAN STONE

Although choledocholithiasis is the most common cause of common duct obstruction there are many other possibilities Some are rather bizarre such as migration of ascarids up into the papillary channel and extrusion of long retained bullets from the liver substance into the extrahepatic duct system Primary tumors of the duct papilla duodenum stomach and pancreas are responsible in a fair number of cases Among primary diseases of near by organs the reaction set up by a penetrating duodenal ulcer is most common and that which is secondary to chronic pancreatitis is only a little less so Extrinsic compression is a fairly certain eventuality whenever cancer in the region uses the pericholedochal lymph nodes as repositories for metastases Abdominal Hodgkin s disease sometimes first manifests itself through obstructive jaundice

By far the most important cause of non calculous intrinsic common duct obstruction is stricture secondary either to stone or surgical injury In approximately 85 per cent of patients with common duct stricture there has been an operation on the gallbladder usually cholecystectomy and in many of the others there has been some other surgical procedure in the area The usual site for postoperative stricture is the point of juncture with the cystic duct and the cause is trauma either at the time the cystic duct was dissected free or during its ligation Strictures at the distal end of the common duct are due in most cases to stone injury Although primary fibrosis of the papilla is sometimes described it is never possible to exclude prior damage by a stone which has subsequently passed along Occasionally cicatrization of a long segment or all of the duct develops and then the usual explanation is that there has been a postoperative bile leak or that a persistent external biliary fistula has formed (Fig 203)

Accidental ligation of the common duct is a tragedy born out of the technical difficulties presented by the complexities of the local anatomy It is of course not recognized at the time Accidental division of the duct usually is but the most skillful immediate end to end repair necessarily leaves behind all the conditions necessary for later stricture formation

Benign strictures sometimes develop up within the hepatic ducts producing obstructive effects upon part or all of the biliary tract depending on their location Although they may be far removed from the operative area many instances are encountered in patients who have had gallbladder surgery Usually the explanation is duct damage from the upper end of a T tube or other indwelling device When such a stricture is found in a patient who has not had an operation one supposes that it has been caused by ulceration from a retained stone of intrahepatic origin

CLINICAL ASPECTS

The clinical manifestations of common duct obstruction depend primarily on the rapidity and completeness of the process and only to a limited degree on the nature of the obstructing lesion It is no surprise to find that a history consistent with gallbladder disease is obtained in most patients In approximately

mm of bile water mixture When the gall bladder and duct system are normal the lumen of the common duct upon opacification at cholangiography measures about 5 mm in diameter To a degree the intra choledochal pressure and volume capacity are a *direct function* of obstructive influences at the lower end of the duct The physiologic potency of the sphincter of Oddi in controlling pressure—and even in producing actual functional obstruction—is not clear One notes largely in the European literature a certain interest in hypertonia of the sphincter as a disease entity and sometimes specific diagnostic criteria are listed and sphincterotomy recommended for therapy Primary hypertonia—that is hypteronia in the absence of organic biliary tract disease—appears however to be an uncredited concept

Secondary functional tonic changes in both *the common duct proper and the sphincter* of Oddi are on the other hand very common It has been satisfactorily demonstrated that the sphincter contracts independently of duodenal activity The width of the common duct per se does not give accurate information regarding the tone of the sphincter or presence of other obstructive influences and the assumption is that the tone of the choledochal mural muscle is a factor to be reckoned with After cholecystectomy for instance the common duct rather regularly dilates then averaging about 8 mm in diameter and occasionally reaching 25 mm In some such cases obstruction usually by stone is the explanation but in others T tube manometry indicates no corresponding increase in intracholedochal pressure Unless *dilatation becomes rather extreme* one can not use duct diameter as a criterion for judging obstruction by retained stone once the gallbladder has been removed Although it is far from proved one gains the impression clinically that the degree of postcholecystectomy ductal dilatation is not influenced by the length of the time lapse following operation

The mere presence of stones in the gall bladder or in the common duct often causes or at least is accompanied by periodic spasm of the sphincter of Oddi This sometimes can be demonstrated by cholangiography *In such* cases the duct does not necessarily become dilated If a T tube has been inserted the sphincter can be induced to relax by withdrawing a few milliliters of choledochal contents and replacing them with a solution of procaine

Of commonly used drugs morphine leads to the greatest increase of choledochal pressure through induction of sphincter spasm Although actual pressure measurements can be made only if a T tube is in place the mere effect of morphine on cholangiographic appearances proves sustained sphincter closure Other opiates have a similar but less marked action This applies to Demerol although the initial studies with this drug led to early hopes that there would be little hypertonic *effect* on the sphincter *The* sphincter can be made to relax temporarily if it is hypertonic at the time through use of the nitrites aminophyllin and the anticholinergic drugs Their action is rather unpredictable as judged by intracholedochal pressure reduction and much more so when measured through clinical response

MECHANISM OF OBSTRUCTIVE CHOLEDOCHOLITHIASIS

When a stone becomes arrested *in the* common duct it usually lodges at the end of the extraduodenal portion of the duct This is the area where the lumen suddenly becomes narrow as the duct enters with obliquity the substance of the duodenal wall It is far proximal to the point which when obstructed might encourage bile reflux into the main pancreatic duct Whenever a stone becomes impacted in the common duct the sphincter of Oddi probably becomes reflexly hypertonic *This could not encourage reflux* either unless the papillary portion of the muscle were more spastic than the rest the bile bypassed the stone and a common channel were present But this is a region which is particularly difficult to study both at operation and at autopsy and the exact conditions

tients with symptomatic choledocholithiasis and in almost all of those with either common duct stricture or tumor obstruction In other words except when a stone is at fault common duct obstruction has almost always progressed to the stage of jaundice by the time the patient feels it necessary to seek help If the common duct has been cut or ligated at surgery jaundice appears quickly after operation while a postoperative stricture may not lead to jaundice until months or years have passed Whatever the cause of obstruction—and this includes tumor—the jaundice may be mild and may stay that way In other patients it may fluctuate considerably from time to time Except perhaps when the common duct has been ligated there is no obstructing disease which is invariably accompanied by progressive jaundice even though this is the tendency Intermittency of jaundice is not rare in carcinoma of the common duct In most cases of obstruction of course intense jaundice appears eventually unless acholia supervenes or surgical or spontaneous relief from the offending lesion is obtained The presence of pruritis depends largely on the degree and duration of obstruction It is a frequent complaint

The other manifestations are the expected accompaniments of jaundice The patient frequently has noticed that his stools have become lighter in color and his urine dark If cholangitis has developed there will be chills and fever Weight loss is variable depending on the amount of vomiting and anorexia and on the nature of the responsible disease There may be associated pancreatitis tending to obscure the pain picture The development of hepatic coma is rare

Physical examination may give very little help towards diagnosis Cholecystectomy scar jaundice weight loss and self inflicted scratch marks may or may not be present If the jaundice is intense and the history and other physical findings do not suggest hepatocellular failure one may ordinarily think in terms of obstructive jaundice At this stage of common duct obstruction however the liver is often enlarged and tender as a result of secondary cholangitis and one may feel insecure about the possibility of an intrahepatic obstructive process

The findings in the gallbladder area are helpful in some patients Although Courvoisier s law may at times lead one astray it is fair to say that it has stood the test of time rather well It states that generally common duct obstruction which is due to stone is not accompanied by distention of the gallbladder because the probable presence of chronic cholecystitis prevents it but common duct obstruction due to tumor can be expected to lead to palpable distention of the gallbladder because the organ probably is not diseased

LABORATORY AND ROENTGEN ASPECTS

In addition to the biochemical changes which develop in extrahepatic biliary obstruction as already mentioned there are in some patients a few associated laboratory findings of considerab e interest Rather often at the height of and immediately following an attack of acute common duct obstruction albumin and casts appear in the urine It is said that biliuria causes enough renal irritation to explain this The albumin and casts usually disappear by the time clinical jaundice fades away The erythrocyte sedimentation rate does not have the degree of usefulness here that it does in acute cholecystitis but it demonstrates enough sensitivity to ascending infection of the biliary tract to make it indispensable for following the patient s course If cholangitis develops leukocytosis also appears In an exceptional patient the leukocyte count reaches very high levels with pseudoleukemoid characteristics Associated pancreatitis which is rare in a recognizable form leads to moderate elevation of the serum amylase and serum lipase in about 15 per cent of cases of obstruction which are due to stone

In the presence of obstructive jaundice neither oral nor intravenous cholangiography can cause the ducts to become opacified If obstruction is intermittent however intravenous cholangiography carried out when bile

one quarter of the cases which are due to stone there is the history of cholecystectomy One must be prepared however, to encounter many patients whose first sign of illness is that of duct obstruction

Pain is the most common complaint and it is the symptom responsible for sending about three quarters of the patients to the doctor In most cases there is typical biliary colic In others the pain may be constant and relatively mild or it may gradually change from paroxysmal colic to a constant ache Although the patient usually localizes it either in the midepigastrium or a little to the right of midline it sometimes is felt precisely over the precordium in the left upper abdominal quadrant in the right flank or entirely posteriorly in the lumbar area Wherever the pain seems to be it may radiate to the precordium the left shoulder and even along the left arm Rather often there is aggravation upon deep inspiration



FIG 203 Cicatrization of common duct one month following cholecystectomy which was complicated by postoperative bile leakage

Nausea and vomiting are almost as common as pain although they sometimes come only in brief mild attacks The reflex appears to be due simply to distention of the common duct It is a hoary surgical saw that any patient with gallbladder disease who does a lot of vomiting probably has a common duct stone

Jaundice or a history of recent jaundice is encountered in perhaps two thirds of pa

secondary to stone or surgical damage may take the form of simple division of the stric tured area local resection with end to end duct repair resection and use of a special prosthesis to make up for the gap in the duct or of hepaticoduodenostomy depend ing on the nature of the lesion In some pa tients duct reconstruction never seems to give good results and after an attempt or two choledochoduodenostomy may be considered the best solution When a stricture lies high in the hepatic ducts search for the area may necessitate considerable dissection of the liver

HEMORRHAGE AND HEMOCHOLECYST

The biliary tract is an unusual source of important gastrointestinal hemorrhage but because emergency control of bleeding which arises in the ducts is difficult or if the source is intrahepatic quite impossible sometimes a very dangerous situation is created There are many diseases of the gallbladder and duct system which are capable of producing blood loss but it is ordinarily not of large amounts Simple acute and chronic cholecystitis are very often accompanied by occult bleeding and malignant tumors almost always are Acute hemorrhagic cholecystitis which is characterized by rather sudden unexplained development of multiple mucosal erosions is capable of causing quick exsanguination The simple erosions which accompany chole cystolithiasis frequently bleed enough to pro duce positive results upon stool guaiac test ing but only on rare occasions as when there is mucosal infarction is the bleeding of significant amounts Cruveilhier like ulcers of the gallbladder which are apparently primary lesions and which have histopathologic fea tures similar to those of simple duodenal ulcer are recognizable clinically only if there should be hemorrhage The cholecystic artery with its branches is one of the most com mon of the visceral arteries affected by peri arteritis nodosa and although if local injury is done it usually takes the form of infarction bleeding into the gallbladder lumen some times occurs Rupture of a submucosal scle rotic artery is very rare Finally following penetrating wounds of the liver most of the resultant bleeding may be directed into the duct system rather than out into the perito neal cavity

Hemocholecyst means merely a gallbladder filled with blood The source of the blood is usually the gallbladder itself but it may be the duct system or through reflux the duo denal contents Whatever the underlying dis ease may be hemocholecyst often presents itself as a primary clinical problem The blood may be emptied easily by the gall bladder and flow quickly down the ducts but sometimes it clots and causes obstruction and severe colic Because it often produces symptoms and signs much like those of acute cholecystitis it may lead to cholecystectomy before the basic diagnosis is made

THE POSTCHOLECYSTECTOMY SYNDROMES

When the diagnosis is symptomatic chole cystolithiasis and the treatment is cholecyst ectomy the patient has an 85 per cent chance of cure When the diagnosis is symptomatic noncalculous chronic cholecys titis and the treatment is cholecystectomy he has only a 50 per cent chance of cure The implication is clear gallstones can be a potent source of illness and the diagnosis of chole cystolithiasis is a reasonably accurate one but cholecystographic discovery of a poorly functioning gallbladder without stones is often a poor explanation for abdominal symptoms Patients who continue to have their former complaints or who develop new ones following cholecystectomy are said to have one of the postcholecystectomy syn dromes A great variety of painful and dys peptic symptoms may be represented and there are many explanations Whether or not the cause lies in the biliary tract it is well to remember that whenever the gallbladder is diseased the whole biliary tract is diseased to some extent and cholecystectomy eradi cates only part of the process

is flowing freely is able to furnish a precise diagnosis in addition to giving information regarding the degree of common duct dilatation The situation is ideal for roentgen diagnosis if a T tube should be in place Even though a stone may escape visualization its presence can often be deduced from incomplete filling of some portion of the system The presence of an air bubble is likely to cause the main interpretational problem

TREATMENT

Quite obviously choledocholithiasis and all other diseases which cause common duct obstruction require surgical therapy Obstructive jaundice is not a surgical emergency but there is about it something of surgical urgency The type of procedure required depends entirely on the nature of the obstructive process For stone choledochotomy with cholecystectomy if that has not already been done usually suffices A T tube is temporarily left in the common duct and in addition to permitting postoperative cholangiography it furnishes the means for testing patency of the distal portion of the duct Before the tube is pulled out—often during the second postoperative week—its drainage arm is clamped off for at least three days If the duct is not clear fever pain and jaundice develop in response to obstruction and ascending cholangitis

Although treatment of common duct stone seems simple enough it should be noted that the offending object may easily be overlooked at cholangiography at operative palpation of the duct and during probing of the duct In about 20 per cent of all cases of common duct stone the surgeon is not able to find it at the first exploration Postoperative troubles are common and often discouraging Persistence of obstruction or development of new obstruction is the main problem the cause usually being either failure to recognize at operation that the common duct contained more than one stone or stenosis at the site of surgical repair Bile leakage at the anastomic site is not a major problem Sometimes latent cholangitis persists in spite of relief of obstruction Spontaneous postoperative rupture of the common duct is a rare complication the usual explanations being pericholedochal infection vascular injury and continued obstruction

In situ dissolution of common duct stones is a technic which has a limited field of usefulness The patient must have a T tube or catheter in his common duct and because stones are better picked out of the common duct than dissolved out this usually means that the technic is used only when postoperative cholangiography reveals the presence of a stone overlooked at operation Ether and chloroform are the only known effective gallstone solvents Cholesterol stones dissolve rather rapidly in either and other types vary depending to a large extent on their cholesterol content The procedure calls for daily slow instillation of about 2 ml of ether through the T tube or catheter after the duct has been aspirated of its bile Slow instillation is important in order to avoid the distention pain of ether vaporization The ether is followed by 10 ml of olive oil Completion of the dissolution may require from one to eight weeks

Pharmaceutic forms of biliary flush for ridding the ducts of incompletely obstructing stones do not have many advocates because of a failure rate of about 75 per cent and because of the danger that unrecognized complete obstruction might be present Most of the suggested regimens call for the successive administration of a nitrite magnesium sulfate olive oil and dehydrocholic acid over a period of several days

For treatment of malignant and some other types of obstruction it is fortunate if the gallbladder is still present and serviceable to use for making a biliary shunt to the stomach or jejunum Cholecystogastrostomy or cholecystojejunostomy is preferred to cholecystoduodenostomy by most surgeons because of the danger of external duodenal fistula following the latter procedure Duct obstruction secondary to reaction about a penetrating duodenal ulcer usually calls for cholecystogastrostomy Treatment of strictures

tion of cases The diagnosis can be established only after surgical exploration

An especially interesting explanation for postoperative symptoms is persistence of a cystic duct remnant indicating an incomplete operation with the several complications it presence is easily made during the routine cholangiographic study which is carried out after cholecystectomy (Fig 204) The remnant may measure up to three or more centimeters in length a size which usually seems inconceivable to the surgeon who per



Fig 204 Excessively long cystic duct stump demonstrated by operative cholangiography through T tube

may cause Hartmann's pouch is the ampulla at the junction of gallbladder and cystic duct If it is not removed at cholecystectomy it is capable of expanding into a "new gallbladder" Even when the diverticular remnant does not actually enlarge there is no tendency for it to become atretic and disappear as time goes on. Diagnosis of the stump's formed the operation After months have passed the lumen may become passively distended and then x ray study seems to show that the gallbladder has reformed The problems created by a cystic duct remnant are those of residual lithiasis and infection The main symptom is pain much like gallbladder pain Obstruction at the common duct junc

ERRONEOUS DIAGNOSIS

The common explanation for the post cholecystectomy syndrome is simply erroneous diagnosis Usually the postoperative symptoms are similar to or the same as those which led to operation with or without aggravation In most cases operation followed discovery of poor cholecystographic visualization of the gallbladder during investigation of complex dyspeptic symptoms The gallbladder may well have been severely diseased but nevertheless not have been responsible for the patient s symptoms Very often it turns out that the problem was primarily an emotional one Among the functional or dyskinetic processes the hepatic flexure syndrome is most likely to be mistaken for gallbladder disease When organic disease elsewhere than in the biliary tract is found in retrospect to be the true explanation for the symptoms even though the extirpated gallbladder itself was diseased as expected one of the combined disease complexes is often at fault Of special importance is Saint s triad because here quite regularly gallbladder disease is first to be thought of first looked for first found and first treated But only in a small proportion of these patients does eradication of the cholecystolithiasis provide symptomatic help Other common responsible processes associated with silent gallbladder disease are osteoarthritis of the spine recurrent retrocecal appendicitis chronic pancreatitis duodenal ulcer and right kidney disease Gastritis is not an explanation for the postcholecystectomy syndrome

BILIARY CAUSES

Intravenous cholangiography is an essential part of the investigation of any patient with postcholecystectomy syndrome and it frequently reveals abnormalities of one sort or another But it is important not to repeat a mistake and ascribe postoperative symptoms to simple reflex changes secondary to loss of the gallbladder Thus ductal dilatation is to be expected following cholecystectomy Whether or not dilatation existed prior to operation in most patients there eventually is compensatory widening of the common and hepatic ducts presumably to be teleologic to make up for the lost reservoir Sometimes the contrast medium fails to pass on into the duodenum for one or two hours in spite of good ductal filling Although the dilatation can often be correlated with a rise in intra choledochal pressure however spasm of the sphincter of Oddi is no longer considered a potent source of postcholecystectomy symptoms Biliary dyskinesia probably exists but in trying to think about it one is hindered by a confusing lack of diagnostic criteria With better appreciation of emotional causes of postcholecystectomy symptoms and with current availability of better technics for detecting retained common duct stones one notes that the need for functional sphincteric diagnoses is not as important as it once seemed to be

Overlooked stone in the common duct is the most important local explanation of postcholecystectomy symptoms The pattern of the complaints is often the same as that which existed prior to operation Colicky pain in the biliary area perhaps with radiation to the back is the main manifestation It should by itself raise the possibility of retained stone Jaundice develops in about two thirds of the cases only Vomiting is common Fever points to persisting cholangitis secondary to intermittent obstruction and is to be expected in about one third of the patients Critical evaluation of the clinical manifestations is important because retained stones cannot always be demonstrated by cholangiography

Appearance of new regional symptoms following cholecystectomy usually indicates either operative injury of the common duct or development of a common duct stricture Postoperative adhesions between the duodenum and the gallbladder bed occurs rather frequently judging from upper gastrointestinal fluoroscopy but symptoms cannot necessarily be ascribed to them unless actual obstruction should result Postoperative neuroma of the junction of hepatic and common ducts can be incriminated in a small propor

100 per cent of gallbladders with carcinoma contain stones Approximately 1 per cent of people who have cholecystolithiasis at the time of death have carcinoma of the gall bladder

The great majority of tumors—about 85 per cent—are adenocarcinomas which grow in a papillary form Scirrhous infiltrating types are rather unusual and epidermoid carcinoma is rare being reported in only about 4 per cent of cases Sometimes adenocarcinomas assume the characteristics of mucoid tumors and neoplastic mucocele of the gallbladder may be the result

Usually growth begins in the fundus Characteristically there is rapid growth through the whole organ and uninhibited invasion of near by organs Spread into the liver substance may soon be far more extensive than the cholecystic mass and at autopsy it may be interpreted grossly as a primary liver tumor (Fig 205) Direct extension into the common duct is frequent as is extrinsic occlusive pressure on the duct



FIG 205 Autopsy findings in case of carcinoma of the gallbladder with extensive invasion of adjacent liver

In contrast to the prominent invasive tendency mestastasis usually does not proceed until late in the course The exception may be liver metastasis but the point is difficult to determine because at autopsy it is usually very difficult to distinguish liver metastases from nodules secondary to direct extension In addition to the liver the common sites of spread are the regional nodes of the lesser omentum peritoneum and lungs Pulmonary metastases generally develop close to the pleural surfaces of the lower lobes and they usually grow very slowly The ovaries are a moderately common location for implantation Supraclavicular metastasis rarely occurs

CLINICAL ASPECTS

The most common subjective manifestation is pain About three quarters of the patients have pain at the time of the first examination It tends to be constant and to be localized either directly over the gallbladder area or in the center of the epigastrium Loss of weight is common a good part being ex

tion may lead to abscess formation This appears to be a real threat judging by the frequency with which jaundice develops and pericholedochal inflammation is found at re exploration Treatment of course calls simply for surgical amputation of the rem nant

BENIGN MASSES

These are uncommon processes which for the most part either are encountered unex pectedly at autopsy or are identified only following operation carried out for an un certain or erroneous diagnosis Their clinical behavior depends largely on whether their location encourages them to obstruct the gall bladder or common duct

BENIGN TUMORS

Benign tumors of the fundus and body of the gallbladder become responsible for ill ness only if they grow to a large size or if they should become eroded and bleed Both cir cumstances are unusual Most benign tumors that are found during life are detected as small sessile polypoid masses during chole cystography but not often can they be blamed for the symptoms which led to study Because identification cannot be made ex cept through histopathologic examination most clinicians believe that detection calls for cholecystectomy The papillomas have the greatest significance because at times they are associated with carcinoma of the gallbladder They are found in both men and women and usually come to light during the fourth or fifth decade Adenomyomas fibromas benign lymphomas benign melanomas myxomas lipomas and neuromas are the other possibil ities

Benign tumors of the small intrahepatic biliary radicals appear to be a little more common than those of the extrahepatic ducts Among the latter the common duct is the usual site of involvement or at least the most often recognized In any case benign ductal tumors are considerably less common than carcinoma In addition to the usual mani festations of duct obstruction these lesions rather often become eroded and bleed Chol angiography does not give much diagnostic information after jaundice develops The need for surgical relief of obstruction is often the clinical impression when the patient is first examined and therefore proper treat ment will usually be carried out without delay Most frequently the offending lesion will be found to be either an adenoma or cystadenoma Much rarer are lipoma xan thoma myoma fibroma neuroma and vari ous compounded types

TUBERCULOSIS

Except during the phase of miliary dis semination tuberculosis of the gallbladder is rare It has for unknown reasons been re ported mostly in women In addition to the miliary form a chronic ulcerative form of tuberculosis occurs often in combination with cholecystolithiasis There is no charac teristic clinical picture Specific diagnosis can be made only at operation or autopsy Clini cal suspicion might arise only if tuberculosis is recognized elsewhere in the body

CARCINOMA OF THE GALLBLADDER

Carcinoma of the gallbladder and of the extrahepatic biliary ducts exclusive of the papilla of Vater accounts for about 4 5 per cent of all gastrointestinal carcinomas found at autopsy The autopsy incidence of carci noma of the gallbladder itself is about 0 3 per cent About four fifths of the patients are women The average age at the time of diagnosis is about 60 years the usual age range is from 50 to 70 years and the possible age range is unlimited

PATHOLOGIC ASPECTS

The association of gallbladder carcinoma with gallstones is quite clearly an important one and although effect and cause have not been proved students of the disease have found it necessary to assume that the presence of stones or something associated with their presence is carcinogenic An irritative not a chemical action seems likely It has been found from series to series that from 75 to

infiltrating tendency One supposes that at least part of the difference is more apparent than real because in the ductal location the lesion calls attention to itself far earlier than does carcinoma of the gallbladder

Three growth forms may be recognized There is a papillary or villous form which tends to grow intraluminally filling and distending the duct and causing early obstruction The medullary type remains small but encircles the duct in addition to blocking its lumen The diffuse form usually remains within the duct wall constricting the lumen and it may extend for a considerable distance up into the hepatic duct branches Whatever the growth pattern there is no more cholelithiasis in this disease than there is in a comparable segment of the unaffected population

Metastases tend to occur late again probably because the primary lesion causes sickness early Metastatic paths are notoriously variable Tumor may appear in most any organ The common sites are the regional nodes liver lungs and peritoneal surfaces

CLINICAL ASPECTS

About twice as many men as women are affected and the diagnosis is usually made during late adult life

Nonspecific gastrointestinal reflex symptoms are prominent and for several weeks they may be the only evidence of illness Nausea vomiting anorexia and diarrhea or constipation are usually present to some degree The more specific clinical manifestations are of course secondary to mechanical blockage of the duct Obstructive jaundice is the main feature and it is usually progressive and unremitting In some patients however it shows wide fluctuations and it may even clear altogether for brief periods In some clinicians experiences the jaundice of common duct cancer has shown a greater tendency to fluctuate than that due to choledocholithiasis This is a most important point to recall in making a clinical differentiation between the various lesions which may be responsible for obstruction Accompanying the jaundice there is often severe pruritis and eventually the manifestations of ascending cholangitis usually develop Often there is pain which may either have the characteristics of biliary colic or may be dull and constant Carcinoma of the duct is however one of the important diagnostic possibilities when painless jaundice is encountered Weight loss does not necessarily appear until late in the course being dependent largely on the degree of vomiting and anorexia Gross bleeding into the bowel is only occasionally observed but periodic occult blood loss is very common Secondary iron deficiency anemia may be the result

Infrequently can a tumor mass be palpated until late in the course If the hepatic and cystic ducts are patent and if there has been no cholecystitis a distended gallbladder may be palpable in confirmation of Courvoisier s law Ascites eventually develops in about half of the patients

Clinical diagnostic procedures are notably impotent in this disease Determination of the obstructive basis for the jaundice is met by no special difficulties but usually there is nothing about the patient at the outset which would suggest cancer Intravenous cholangiography may be successful in outlining the ducts if back pressure has not yet injured the liver to any extent but the nature of the obstructive process is not easily interpreted

TREATMENT

Specific diagnosis ordinarily is made by surgical exploration It may be possible at that time to extirpate the lesion with the intent of cure The results are very much better than they are in the case of primary carcinoma of the gallbladder If the tumor is beyond cure the surgeon must make every effort to establish biliary drainage through by pass of the obstructed area

plained by anorexia nausea and vomiting Jaundice of moderately constant degree appears eventually in about half the cases With common duct obstruction ascending cholangitis may develop, adding chills and fever to the picture Constipation is the common bowel manifestation Weakness and general debility often develop to a severe degree within a month or two of the symptomatic onset

The tumor can be palpated in about one third of the patients at the first examination Hepatomegaly develops in only about one third and inspection of the liver at autopsy shows that in spite of massive tumor involvement the organ has been replaced rather than enlarged An hepatic friction rub is common

Roentgenologic study of the gallbladder is not often helpful The organ can be opacified to some degree in only about one third of the cases If it can the chances of an accurate diagnosis are fairly good Strangely in an occasional case the cholecystographic contrast medium becomes hyperconcentrated in the gallbladder

TREATMENT

The average patient survives only about six months after the onset of symptoms regardless of the form of treatment About one of 50 patients survives five years It is clear that in order to justify attempts at radical surgical extirpation the surgical mortality rate would have to be very low It is not and for the great majority of patients the doctor cannot offer any reasonable effort at curative therapy Very radical surgical attacks which have gone as far as total right hepatectomy have not yielded encouraging results Almost always diagnostic confirmation awaits surgical exploration however and at that time it may be possible for the surgeon to do something to eliminate common duct obstruction if that has occurred or at least to drain the biliary tract for relief of jaundice and pruritis

The common association of gallbladder carcinoma with gallstones and the absence of any practical therapeutic approach to the disease bring up a frequent source of argument whether removal of all gallbladders which are found to contain stones is a reasonable prophylactic gesture The answer is No and the reason is that relatively carcinoma is such a rare disease of the gallbladder The meager mortality rate associated with simple cholecystectomy is greater than the threat of carcinoma

SARCOMA OF THE GALLBLADDER

The autopsy incidence of sarcoma of the gallbladder is about 0 02 per cent Apparently all of the common sarcoma types may occur either as a primary tumor or as part of multicentric sarcomatous disease Sarcoma of the gallbladder behaves very much as does carcinoma but here there may be the opportunity for x irradiation therapy or for chemotherapy

CARCINOMA OF THE EXTRAHEPATIC DUCTS

Carcinoma of the ducts is only one of several primary tumors which develop within the restricted area of the biliary bed and which manifest themselves mainly through ductal obstruction Clinical diagnosis of any one of them may be very difficult or impossible and there is nothing about the behavior of this particular tumor which one could consider unique for diagnostic purposes About half of the lesions are believed to begin at or close to the conjunction of cystic hepatic and common ducts Primary carcinomas further down the common duct and up along the hepatic duct comprise almost all the rest Carcinoma of the cystic duct is very rare To be realistic it is necessary to admit that determination of the precise site of origin is often impossible at either operation or autopsy Primary carcinoma of the papilla of Vater is best thought of as a duodenal lesion

PATHOLOGIC ASPECTS

Most ductal carcinomas are poorly differentiated adenocarcinomas The structure is similar to that of primary carcinoma of the gallbladder with the exceptions that there is more fibrosis and that the primary lesion tends to remain small There is not the widely

CHAPTER 18

PANCREAS

INTRODUCTION

To the clinician the pancreas is characterized mainly by inapproachability Anatomically it is not only smaller and more deeply located than any other major part of the gastrointestinal tract but it is also obscured in its physical configuration by fat and peritoneal packing When normal it cannot be seen felt or heard It cannot be made radiopaque and it has enough physiologic reserve so that it exhibits no evidence of deficiency until disease is far advanced For these reasons pancreatic disease is more difficult to diagnose than most

PANCREATIC DISEASE NEUROSIS AND THE DOCTOR S PROBLEM

Perhaps in part because chronic pancreatic disease tends to cause symptoms which do not suggest an organic source for a long time it is very common to find that neurosis is the clinical explanation for the problem for months prior to definitive diagnosis But there is more to the relationship between chronic pancreatic disease and neurosis than simple clinical misinterpretation and it is important that the former diagnosis when finally recognized not be merely substituted for the latter

There is something about chronic pancreatic disease which alters normal emotional responses The result is a patient who creates problems in doctor patient relationships If it is difficult for the doctor to evaluate his own reactions to patients of this category he has only to observe those of the nursing and house staff to the patient with chronic pancreatitis This patient above all others is the one whose readmission to the hospital is likely to be met by the least sympathy from those who will take care of him Perhaps this is because he is often a chronic alcoholic who

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readily but there is no bowel dilatation and no actual puddling

From the nutritional point of view the creatorrhea of pancreatic insufficiency is more important than the steatorrhea although its presence is not nearly as obvious Microscopic examination of the stool shows incompletely di ested meat fibers as the most characteristic laboratory feature Measurement of the fecal nitrogen output does not help in the differential diagnosis of creatorrhea but it is useful in determining the degree of digestive inefficiency Loss of more than 2 gm of nitrogen daily is abnormal

The results of lipocaic deficiency are better known in the experimental animal than in clinical medicine Lipocaic is the pancreatic hormone which governs utilization of fat by the liver Although there may be reasonable doubt regarding the validity of some of the oft repeated suppositions about lipocaic some mechanism for pancreatic control over liver fat must be assumed Following total pancreatectomy fatty metamorphosis of the liver usually develops the circulating lipids are decreased and serum alkaline phosphatase activity is increased then if autoclaved pancreas is added to the diet all are reversed to some extent In children and experimental animals leaving a small amount of pancreas behind at pancreatectomy seems to protect against fatty liver as well as against diabetes The protective action of a small amount of pancreatic tissue in the case of adults is not as impressive A suggestive spontaneous example of the probable importance of lipocaic activity is found in Mauriac s syndrome of small children which is characterized by pancreatic deficiency with diabetes and severe fatty infiltration of the liver

OBJECTIVE TESTS OF IMPAIRED PANCREATIC SECRETION

There is no diagnostic test for pancreatic effectiveness that is quite as useful as simple examination of the stool for evidence of incomplete digestion A great many less direct but more complicated technics have been devised for measuring pancreatic exocrine secretions at the pancreatic level without regard for the amount of secretion required to meet individual physiologic needs There is a touch of clinical artificiality about such tests and for the most part they are of more investigational interest than clinical help

The physiology of pancreatic secretion offers several avenues for measurement of secretory activity Enzyme secretion is under the control both of the vagus nerves and of pancreozymin a hormone which is secreted within the intestinal mucosa Parasympathetic stimulation results in elaboration of thick secretion with a heavy concentration of enzymes Zymogen granules are discharged during the process Water and bicarbonate secretion is entirely under the control of the hormone secretin which arises in the mucosa of the duodenum and proximal jejunum Secretin is elaborated in response to stimulation of the duodenal mucosa by contact of the stomach s hydrochloric acid

The secretin test is one in which pancreatic juice is collected by tube within the duodenum following stimulation by either parenterally administered secretin or as a modification mecholyl Total volume and bicarbonate content are the factors measured The test has been of physiologic interest but it has been abandoned for clinical use because of the potential danger of secretin injection and the notable unreliability of the results

In addition to the amount of undigested fat and protein in the stool crude fecal examination for indications of trypsin activity may be of help when the patient is an infant or young child The test is very simple and inexpensive involving merely gross examination for proteolytic effect after a large drop of fecal suspension has been incubated for an hour on the emulsion side of x ray film The normal response is clear cut evidence of digestive activity In order to avoid the effects of bacterial gelatinases it is necessary to dilute the feces 100 times with water for the test

Just as inefficiency of pancreatic digestion can be measured physiologically through the amount of normal ingestants lost in the feces so it may be measured by determining the

in spite of advice keeps bringing his troubles back on himself or perhaps it is because the professional staff has already been too much frustrated by inability to make any concrete contribution to the patient s health But any one who has observed many patients with chronic pancreatitis or other chronic pancre atic disease must be impressed with another factor, that the neurosis is there too

If it is true that this is a neurosis which is especially prone to affect patient doctor relationship adversely it is only because it is difficult to understand It is born in part out of the patient s failure to realize any help for his symptoms and in part out of lack of re alism in evaluating his own plight The pa tient has then two special problems with his emotions hostility which extends to all who try to help him including his own family and a remarkable propensity for miss ing the point in all his dealings with other people For the doctor these are difficult per sonality traits to manage in a sick person They are easily misinterpreted as evidence that the patient in spite of his protestations does not really want to be helped They engender disinterest or an unexpressed feeling that the doctor is meddling where he is not wanted

Recognition of this special problem which arises in the case of the patient with pancreatic disease is the first matter of concern in ap proaching him his diagnosis and his therapy Because the problem is felt long before di agnosis is established particular attention from the start to the principles of compre hensive gastroenterology in all medical en deavors can help preclude much misery for the patient later on

PANCREATIC INSUFFICIENCY

Apart from its islet function the pancreas is mainly important for its protein and fat digesting activity A rather large number of enzymes are believed to be produced by the pancreas and evidence of new ones is found from time to time but most of the lesser ones do not appear to be required for good nu tritional health There can be severe exocrine deficiency in the absence of overt diabetes but this is unusual Clinically the important results of pancreatic insufficiency are steator rhea and creatorrhea and the nutritional prob lems they create This is of course a digestive steatorrhea as opposed to the small intestinal or absorptive type The latter plus the general features of steatorrhea has been discussed in the chapter on small intestinal diseases Cer tain experimental studies and clinical observa tions following pancreatectomy show that about two thirds of the pancreatic acinar tis sue is required for full physiologic fat diges tion about half for protein digestion and per haps one tenth for carbohydrate digestion These are difficult figures to agree upon be cause of the ubiquity of gastrointestinal di gestive ferments Furthermore full physi ologic digestion is quite a different matter from clinically adequate digestion

Although the results—fat loss—are the same in both types of steatorrhea there are features of the pancreatogenous variety which usually permit its ready differentiation from the absorptive The stool is usually light in color but because carbohydrate digestion is well carried out by nonpancreatic enzymes there is no or little fermentive character to it Fat for the most part is present in masses which can easily be found and identified by either spreading the stool out with an applica tor or stirring it into water As has previously been pointed out accurate chemical measure ment of the amount of fat a person loses in his stool is difficult for the hospital laboratory to manage in a routine fashion Demonstration of lumps of fat by simple gross examination of the stool is proof of pancreatic steatorrhea and the actual amount of fat present is not very important Microscopic examination of the stool regularly shows fat globules and fatty acid crystals The latter are in part the product of neutral fat conversion by the colon bacteria

Unlike the situation found among the ab sorptive steatorrheas roentgenologic study of the small intestine is normal or almost so Transit time is not affected The mucosal pat tern may be a little coarse and the barium sus pension may show a tendency to flocculate

after a meal than when given during the fasting state

The standard technic for determining serum amylase activity requires an hour and is based on the amount of iodine detected starch which remains following action of the serum on a starch solution The results are expressed as Somogyi units Usually normal serum activity ranges below 200 Somogyi units The rapid test of Fishman and Doubilet often proves useful in the hospital admitting room because it requires only five minutes to complete after the blood specimen has clotted It is based on the same chemical principle but the results must be expressed in terms of general Somogyi ranges rather than in actual units

Measurement of blood lipase activity assists evaluation of the patient who may have acute pancreatitis as will be discussed and supplements evaluation of amylasemia The mechanisms behind lipasemia are less well known Normally the lipid digesting capacity of the blood is quite low and a good portion of it is due to esterase rather than oil splitting lipase activity Normal serum lipase appears to be only partly of pancreatic origin When there is obstruction to pancreatic outflow the lipase concentration of the blood rises appreciably The curve representing its level lags about a day or even more behind that of the serum amylase both in its ascendency and descendency and it fails to indicate transient variations in the degree of obstruction as may be suggested by the amylase curve In addition to this physiologic lag the technic for determining serum lipase activity unfortunately requires an incubation period of 24 hours It is based on the digestive capacity of the serum upon emulsified olive oil the results following incubation being measured by titration with sodium hydroxide Units correspond to the number of milliliters of 0 05 *N* sodium hydroxide required for neutralization following action of 1 ml of serum on 2 ml of a 50 per cent emulsion of the substrate In general 1 5 units can be considered the upper limit of normal

There is no practicable means or clinical need for measuring serum trypsin activity

ROENTGENOLOGIC STUDY OF THE PANCREAS

Unless it contains calcified portions the parenchyma of the pancreas cannot be visualized directly by x ray technics and this is a serious handicap to clinical diagnosis Retroperitoneal air study and aortography have proved to be unreliable approaches to the problem Wirsung s duct may be catheterized at operation permitting angiography with either Diodrast or Urokon and sometimes following administration of morphine or direct application of dilute hydrochloric acid by tube to the papilla of Vater the major duct may be opacified during Cholografin cholegraphy For the most part however information obtained by successful opacification of the major duct does not answer the questions that the clinician has about the state of the pancreas With further technical refinements it may eventually be possible to opacify the finer ramifications of the duct system whereupon a great deal of diagnostic help will be forthcoming

In a portion of patients who have a mass in the pancreas detection and sometimes diagnosis is possible by examination of pressure defects on near by opacified organs Unfortunately this necessarily means that a mass must be of some size before it can be found Pyelography may give information about enlargements of the body and tail through demonstration of certain deformities of the left kidney and its pelvis Because of the intimate relationship between the splenic vein and pancreas percutaneous splenoportography may sometimes show a suggestive deformity of the vein in instances of pancreatic carcinoma

Most roentgenologic information comes from fluoroscopy of the stomach and duodenum Masses originating in the body and tail press against the posterior wall of the stomach Depending on their direction of growth and the position of the stomach profile defects may be produced on either the greater or lesser gastric curvature Diffuse enlargements of the pancreas may merely shift the pars media and antrum anteriorly without

amount of material which is digested and absorbed following a test meal Pancreatic tolerance tests presuppose normal absorption and because often the purpose of testing pancreatic activity is to distinguish between digestive and absorptive steatorrhea their diagnostic value is limited unless absorptive capacity is also tested and proved to be normal There are in addition some individual physiologic variables not directly related to absorption which detract from their usefulness The most serious of course is diabetes which so often accompanies chronic pancreatic disease One pancreatic tolerance test involves periodic scan of the blood serum for radioactivity following a test meal of a triglyceride and radioactive iodine compound which requires lipase activity before the iodine can be liberated and absorbed Another is Althausen s starch test which is performed like an ordinary glucose tolerance test but requires digestion of a starch paste meal before the circulating glucose level can become elevated It is combined with an oral glucose tolerance test for comparative purposes The Lipiodol test is crude but simple requiring no venipuncture or complicated equipment The patient is merely given Lipiodol to drink and if fat is digested and absorbed efficiently iodine is released and partly excreted in the urine where its presence can be detected by the simple starch test

THE CIRCULATING ENZYMES

Amylase is produced by both the pancreas and the salivary glands In addition to the major portion which is liberated directly into the intestinal tract there is a small amount which enters the circulation This is excreted in the urine for the most part and possibly a little is excreted in the bile Whenever there is obstruction to normal exocrine outflow either from the pancreas or salivary glands the concentration of amylase increases in the blood The same obtains if renal disease interferes with amylase clearance Whenever amylase content of the serum increases and urinary function is normal urine amylase activity increases manyfold In acute pancreatitis amylase is released into the peritoneal cavity too so that if ascitic and pleural fluid collect their amylase content will be high

Measurement of amylase activity of the peripheral blood is the most important test in dealing with cases of suspected acute pancreatitis and will be discussed further under that disease The other causes of hyperamylasemia must be kept in mind so that there be no danger of ascribing complete diagnostic specificity to it Near by disease such as penetrating duodenal or gastric ulcer and sinus formation from the common bile duct may cause localized pancreatitis and enough obstruction to lead to significant hyperamylasemia Usually the level is below that considered diagnostic for primary pancreatic disease Other abdominal diseases which do not appear to affect the pancreas this directly may similarly be accompanied by elevated serum amylase Peritonitis of any origin and intestinal obstruction are prominent among these

The parotid glands are a potent source of amylase About 80 per cent of patients with mumps develop hyperamylasemia during the early phase of the infection It may reach levels of 1000 Somogyi units and more Hyperlipasemia also develops with levels correlating well with those of the amylase

In the nephropathies there is often a parallel between urea retention and amylase retention Hyperamylasemia to a level as high as 1500 Somogyi units can be ascribed to kidney disease alone in the absence of any pancreatic or parotid derangement

Obstruction of pancreatic outflow may be caused by various pharmaceutic influences and the resulting increase in circulating amylase and lipase may reach levels comparable to those encountered in acute pancreatitis The obstruction appears to occur as a result of spasm at the sphincter of Oddi Morphine is the most potent of such drugs but all of the opiates Demerol Urecholine prostigmine and many other drugs are known to have a similar influence All including morphine exert a greater effect when given

after a meal than when given during the fasting state

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producing a discrete pressure defect There are retrogastric structures other than the pancreas however and their tumors may produce gastric deformities and displacements similar to those for which pancreatic disease may be responsible Notable among these are the retroperitoneal lymph nodes At times gastroscopic examination of the well inflated stomach gives additional information regarding the location and nature of posterior masses which press against the stomach

The duodenum particularly its descending portion is frequently deformed by tumors and cysts of the head of the pancreas Simple pressure which flattens the mucosal pattern of the loop s inner aspect is the most important finding A mass which expands uniformly often remains within the loop and widens it This is a deceptive sign however and when there is no disease in the area successive x ray studies may show considerable variation in the diameter of the loop The area of the papilla of Vater is relatively fixed compared with the duodenal segments above and below it so that *when the head of the pancreas expands towards the right the duodenum may not move uniformly ahead of it* As a result the descending duodenal segment assumes the configuration of a reversed 3 and the sign is so designated In view of the many other types of pressure defects that carcinoma of the head of the pancreas may produce on the duodenum this sign has probably been overemphasized

ANOMALIES

Although the size shape and position of the pancreas are remarkably uniform from cadaver to cadaver as they are studied at autopsy this is not an adynamic organ in its anatomic relationships *any more than it is* in its physiologic activities In particular during life it is not nearly as firmly fixed in its retroperitoneal position as one would guess during dissection It normally slides up and down as much as 2 cm simply in response *to posture* It has not been demonstrated that lateral motion normally occurs Probably no change results in the intraductal pressure from the sliding although the ducts must be affected to some extent As an anomalous situation mobility may be greatly exaggerated even to the point of permitting the pancreas to migrate through a defect in the diaphragm or into an omphalocele

Absence of the pancreas is very rare and is encountered only in greatly deformed stillborn monsters Anomalous lobulations and division of the organ secondary to failure of fusion of the dorsal and ventral anlagen are unusual Variations in the course of the accessory duct of Santorini and the major duct of Wirsung are common

Aberrant pancreatic rests are discussed under the organs affected

ANNULAR PANCREAS

Although an uncommon anomaly annular pancreas has special clinical importance because of the favorable therapeutic opportunity it offers upon identification As a simple mechanical anomaly it shows many degrees of clinical importance Some cases pass unnoticed to be discovered only as an incidental autopsy finding A small number signal their presence soon after birth because high grade duodenal obstruction was produced at the time the pancreas was formed In such cases there often are associated congenital anomalies *Most instances are discovered during* middle age and occasionally the lesion does not call attention to itself until the eighth *decade of life has been reached*

An annular pancreas is one which because of congenital fault encircles a segment of the duodenum The abnormal portion is at the pancreatic head and in most cases it surrounds the upper two thirds or so of the descending portion of the duodenum (Fig 206) Occasionally some other region of the duodenum is involved The encircling tissue is characteristically fibrosed to a moderate degree It usually has its own duct system which enters the duodenum independently of the two normal ducts There appear to be several possible developmental avenues which could be responsible for the abnormal formation

but no cause can be stated No hereditary factor is known

If symptoms are produced they are those of partial duodenal obstruction nausea vomiting excess gas and epigastric pain In infants the main manifestations are vomiting and distention of the stomach Adults may have intermittent mild symptoms for years before they seek help Rather often at the time the diagnosis is made it is found that a duodenal ulcer is also present which leads one to believe that the annular pancreas was really not responsible for the symptoms



FIG 206 Anatomic relationships discovered at operation in a case of annular pancreas

At other times the anomaly comes to light only following an episode of acute pancreatitis which is accompanied by obstructive manifestations suggesting that pancreatic swelling was responsible for transient constriction of the duodenum

To date the majority of diagnoses have been made at operation although roentgenologic diagnosis is quite possible There is no explanation for its utter failure from time to time The characteristic deformity is a smooth uniform constriction of the descending duodenum This may be concentric or the pressure may be exerted wholly on either the inner or outer aspect Above the narrowing in symptomatic cases there is ordinarily a degree of dilatation

Treatment is simply accomplished by gastrojejunostomy It is not permissible to resect the annular portion because of the frequent presence within the tissue of the main pancreatic duct common duct and important vascular structures

MUCOVISCIDOSIS (FIBROCYSTIC DISEASE)

Mucoviscidosis is by far the most important congenital systemic disease in which the pancreas takes part It is not a primary abnormality of the pancreas although often the pancreatic manifestations predominate It is responsible for about 3 per cent of childhood deaths and is the most common cause of chronic nontuberculous pulmonary disease in the pediatric age group Approximately 1 or 2 per 1000 infants are affected without sex preference There is some suggestion that a recessive hereditary factor is at work but even though relatives other than siblings are rarely affected in some series the incidence among siblings seems too high to permit credence in a simple recessive as the genetic determinant It should be noted that a significant proportion of the relatives of affected children have an abnormal sweat test (vide infra) even though otherwise they appear to be entirely healthy

Introduction of improved antimicrobial drugs has already altered prognosis of mucoviscidosis to a great extent Fewer than half the patients now succumb within the first two years of life Although in the past it was unusual for a patient to reach the middle of the second decade teen aged patients are now to be encountered in most average sized clinics The future will bring adult mucoviscidosis and then there will come better understanding of the hereditary aspects—and, no doubt an important new eugenic problem

ETIOLOGIC AND PATHOLOGIC ASPECTS

The basic pathologic aberrations are present at birth For the most part they revolve about abnormality of the mucus secreted by the entire gastrointestinal tract and by the entire respiratory tract In addition there are electrolyte abnormalities in the secretions

producing a discrete pressure defect There are retrogastric structures other than the pancreas however and their tumors may produce gastric deformities and displacements similar to those for which pancreatic disease may be responsible Notable among these are the retroperitoneal lymph nodes At times gastroscopic examination of the well inflated stomach gives additional information regarding the location and nature of posterior masses which press against the stomach

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viscidosis occurs during the neonatal period There appear to be two factors behind the abnormal behavior of the meconium unusual viscidity of the mucus which makes up most of the meconium and absence or deficiency of pancreatic enzymes which are normally responsible for initiating digestion of the meconium s mucoprotein

The respiratory aspect of the disease ordinarily becomes manifest soon after birth with cough colds and periodic fever Prominent cervical lymphadenopathy quickly develop The cough may be almost continuous for months at a time Recurrent pneumonia is common throughout infancy and later the problems of bronchiectasis emphysema and hypoxia supervene When bronchiectasis and evidence of vitamin A deficiency are the main features of the disease the combination is sometimes known as Andersen s triad The lungs upon physical examination show rales atelectasis and emphysema The latter may produce deformity of the chest and cause the liver to descend far below the costal margin Intermittent cyanosis clubbing of the fingers and cor pulmonale may eventually appear Pulmonary infection is the killer

Digestive and metabolic abnormalities show varying degrees of severity Poor weight gain failure of growth and several specific types of malnutrition are characteristic Nutritional insufficiency often is accompanied by abdominal distention and underdevelopment of the buttocks which when associated with emphysematous chest deformity give the baby a characteristic and sometimes grotesque appearance In spite of this the patient usually has a ravenous appetite Steatorrhea is prominent although not necessarily progressively severe and it is characterized by the familiar features of frequent large foul pale stools with lumped fat Problems with utilization of the fat soluble vitamins are common and outspoken rickets may develop Anemia is usual This is most often hypochromic but occasionally nutritional megaloblastic anemia is encountered Rectal prolapse is common An interesting feature of the general debility is special susceptibility to heat exhaustion The babies do not necessarily sweat more than normal

SPECIAL OBJECTIVE TESTS

All of the tests for pancreatic insufficiency are applicable here but again those carried out on the feces give the most realistic information Most of the others in addition are very difficult to carry out on babies The best roentgenologic information is obtained from study of the pulmonary abnormalities but the findings are not at all specific for mucoviscidosis

The sweat test is positive in about 95 per cent of the babies and it is believed to be specific for mucoviscidosis It has as its purpose detection of the abnormally high sodium and chloride content of the sweat The potassium is not measured because some normal people show increased concentration from time to time Normally sweat contains less than 80 mEq/liter of sodium and 70 mEq/liter of chloride For the test the baby s back is cleaned with distilled water a weighed gauze patch is applied to the back and covered with a plastic sheet and the baby is enclosed to the neck in a plastic pillowcase After one hour the baby is removed and the gauze patch weighed and washed The washings are then analyzed for salt content

The saliva test for abnormally high salt concentration has not yet been well standardized but promises to be useful It is based on the same principle as the sweat test and is carried out by collecting saliva on a cotton pledget and determining its salt content

TREATMENT

Treatment has two purposes to improve nutrition and to treat and prevent pulmonary infection There is no way to correct the mucus defect so that support and prophylaxis are the principles Fortunate it is that the patient s appetite is usually excellent For nutrition s sake the diet should be as full as possible There is no value in limiting fat except as it may change the character of the stool and this is remarkably unimportant as compared with acceptability of the food An

of the sweat glands lacrimal glands and sali vary glands If it were not for these non mucous secretory abnormalities the histo pathology could be well explained on the basis of either absence of natural mucinases or introduction of basic chemical abnormali ties at the time of mucogenesis Mucus with increased viscosity is produced by all organs which normally produce mucus and in all of them it is the obstructing effect of their own secretions which is responsible for the tissue disease

The pancreas secretes a viscid material which blocks the pancreatic ducts precludes normal exocrine efficiency and causes back pressure on the acinar tissue Ductal dilatation and cyst formation are the main mechanical results Pancreatic enzymes are released locally leading to parenchymal fibrosis and a varying degree of lipoid transformation The acinar tissue atrophies The islets of Langerhans are usually spared and diabetes is a rare complication

All of the gastrointestinal mucus forming glands are similarly affected but to a lesser ex tent The degree of secondary obstructive damage depends on the arrangement of their duct system The salivary glands do not un dergo the same degree of histopathologic change although qualitatively it is the same and clinical problems do not ordinarily arise The secretion of Brunner s glands and of the jejunal mucosa is very thick but it does not seem to interfere with small intestinal absorp tive activities Histopathologically the gall bladder is sometimes abnormal but no clini cal disease can be ascribed to it The liver does not fare so well considerable damage resulting in some cases from obstruction of the finer biliary ducts Focal bile stasis fibro sis and ductal hyperplasia are found in three quarters of the cases at autopsy Outspoken biliary cirrhosis with portal hypertension has been reported

Bronchial and pulmonary involvement is virtually a constant feature of the disease *It varies in degree but in most patients seems to have primary control over their fate* The basic pulmonary problem is that of obstruc *tion due to failure of the natural mechanisms* to clear the abnormal mucus Widespread and severe bronchial obstruction is produced and is quickly complicated by secondary in fection *Staphylococcus aureus* is the usual bacterial agent and bronchitis bronchiectasis and pulmonary fibrosis the common results It seems probable that chronic vitamin A de ficiency secondary to pancreatic failure adds to the obstructive element by encouraging epithelial hyperplasia within the bronchioles Damage is often patchy in its distribution Compensatory emphysema develops in un affected areas In addition to disturbance of ventilation and gas exchange chronic cor pulmonale may eventually supervene Club bing of the fingers appears as part of the pic ture of chronic pulmonary insufficiency

Ear sinus and laryngeal infections are com mon Nephrocalcinosis is sometimes found at autopsy but this is believed to be secondary to the total chronic illness rather than to any part

No specific histopathologic lesion can be found in the sweat and lachrimal glands and the abnormality here seems to be a purely chemical one Although sweat and tears are on rare occasions normal characteristically there is marked increase in the concentration of chloride sodium and potassium This is a primary feature of the disease independent of the gastrointestinal and pulmonary changes

CLINICAL FEATURES

Mucoviscidosis mav manifest itself through *any combination of organ troubles* Thus clinically there may appear to be little pan creatic disease or the liver problem may be the most prominent part of the picture If the presence of overt disease has not been recog nized shortly after birth it is almost always possible to obtain a history of vague sickli ness dating back to the time of birth In about 10 per cent of the patients troubles begin in *the neonatal period* with meconium ileus Mucoviscidosis is the major cause of meco nium ileus and this complication is always the explanation when death from muco

with the final common pathway vascular injury is not very clear The most obvious is direct trauma The acute pancreatitis which follows crushing and penetrating injury is usually well localized It may not be recognized clinically until the pancreatitis progresses to cyst formation Postoperative pancreatitis may be a similar type of process although here the organ itself is not necessarily touched or otherwise injured during the course of the operation In about one third of all patients who have abdominal surgery there is a brief postoperative period of significant hyperamylasemia usually it is true in patients who are receiving opiates Clinically important pancreatitis occasionally develops particularly when the operation has included gastrectomy or common duct instrumentation Postpartum pancreatitis may be mentioned in this general category although it seems to be rare furthermore there is question of whether a true situational relationship exists in view of the several postpartum weeks which sometimes elapse prior to its onset

That infection is capable of setting off the process is most clearly shown in mumps Acute pancreatitis presumed to have characteristics common to other types—it is never fatal and little pathologic evidence is available to prove this—is recognized clinically in about 5 per cent of patients with mumps Certain other infectious diseases notably typhoid fever and coccal septicemias are occasionally complicated by pancreatitis

The most common diseases associated with acute pancreatitis are those of the biliary system most often chronic cholecystitis with gallstones About six times as many people who die of pancreatitis have gallstones as do comparable groups who die of other causes Approximately two thirds of women who develop acute pancreatitis have stones and one third of men The implication usually drawn from this striking frequency of associations is that through obstruction of the lower end of the common duct by stone impaction or reflex sphincter spasm reflux of bile into the duct of Wirsung is encouraged leading to intraductal activation of the pancreatic enzymes autodigestion of the duct system and liberation of the ferments The theory would restrict the possibility of reflux pancreatitis to the 30 per cent of humans who happen to have fusion of the major pancreatic duct with the common duct within the papilla Although obviously more than mere obstruction and reflux must be at work this common channel theory has many advocates Other observers believe that because almost all stone obstructions occur far proximal to the beginning of the common channel reflux secondary to stones could only occur if through common duct ulceration a choledochopancreatic fistula should develop A third opinion on the matter is that reflux of bile into the pancreatic duct system is not only harmless but also may actually be a normal physiologic process controlled by the tone of the papilla s sphincter It can be concluded that cholelithiasis is too commonly associated with acute pancreatitis to be coincidental but that as yet there is no satisfactory explanation for the connection Reflux theories in themselves do not supply an acceptable answer because they attribute no more than a passive role to vascular injury

Whatever other aggravating factors may exist at the time it is clear that acute alcoholism superimposed on chronic alcoholism is a potent initiator of acute pancreatitis It is common to find that a drinking spree has *immediately preceded the initial attack* of acute pancreatitis but a much more impressive experience is to observe how often each successive attack in patients with relapsing pancreatitis is set off by drinking The personnel of every hospital admission room are familiar with a group of patients who when admitted with acute pancreatitis time after time can regularly be predicted to be drunk Conversely the main worry of the hospital admitting officer when faced with the familiar problem of the drunk transient is not only whether or not there has been head injury but also whether there is any suggestion of acute pancreatitis It is probable that much of the abdominal pain of acute alcoholism and most of that which occurs in methyl alcohol poisoning is due to acute pancreatitis

exception is found in those patients in whom recurrent rectal prolapse poses a problem for here frequent bowel movements must be dis couraged Experience shows that the steator rhea of this disease responds rather poorly to pancreatin supplementation as compared with the results expected for the steatorrhea of adult chronic pancreatic insufficiency but pancreatin therapy should nevertheless be pushed vigorously as outlined in the section on pancreatitis Salt supplementation is es sential during hot weather

The schedule for administering antimicro bial drugs may take various forms depending on whether at the moment therapy or prophy laxis is the purpose Penicillin Aureomycin and Terramycin seem most useful and for maintenance treatment a common practice is to switch from one to the other every four weeks There is no special rule for this and some experienced pediatricians prefer to inter sperse rest periods of a week or more every month Frequent evaluation of the pulmonary situation is the best guide These patients remain relatively free of antimicrobial drug complications but as with other uses of the antimicrobials liberal feeding of buttermilk affords some insurance against secondary bowel problems

PANCREATITIS PATHOLOGIC PROGRESSION

Nonspecific pancreatitis can be considered a single pathologic complex with many stages and potential avenues of progression Differ ent segments of the process are readily recog nized as distinct clinical entities in themselves but in managing a patient with pancreatitis at whatever stage in the progression one misses optimum effectiveness if he does not *keep the bigger* picture in mind Pancreatitis is essentially a chronic disease which at the start and periodically along the way is inter rupted by acute episodes The acute phase is more likely to impress the clinician quite naturally

ONSET

Pathologically the common denominator for the acute phase of pancreatitis in both its initial attack and its exacerbations is local vascular injury The process may end merely in acute edematous pancreatitis or if more extensive in vascular necrosis and acute hemorrhagic destruction of the gland The vascular factor is clearly the important one in determining whether or not parenchymal necrosis becomes part of the picture What ever the final outcome the initial change is in the interstitial tissue not in the acinar parenchyma Here the ducts lie and appar ently they are susceptible to many types of injurious influence particularly ischemia If enzymes escape from the ducts they become activated immediately in the tissues and pro ceed to produce necrosis of fat wherever they encounter it Calcium in large amounts is utilized in saponification of the liberated fatty acids This intravital phenomenon which can be engineered solely by lipase that has es caped the ducts is characteristic only of pan creatic disease Trypsin which escapes at the same time is apparently able to carry out or assist the process of vascular necrosis Necro sis of the rest of the pancreatic tissue shows varying degrees of completeness As an in cidental and purely secondary response acute inflammatory exudate infiltrates the inter stitial tissues

It is clear that duct obstruction by itself is insufficient to produce these changes Ex perimentally acute continued duct obstruc tion may lead to peripancreatic fat necrosis but within the organ there is merely atrophy Parenchymal necrosis develops only if ische mia is added to obstruction Similarly if bile is injected into the pancreatic ducts no necrosis develops unless ischemia has been produced The importance of the vascular factor can be illustrated experimentally by sensitizing the pancreatic arteries to bacterial products and then inducing a Shwartzman reaction whereupon acute hemorrhagic pan creatitis develops

However vascular changes are ordinarily initiated there are suggestive circumstances at the onset of most initial episodes of acute pancreatitis and at many acute recurrences These do not necessarily constitute etiologic explanations or if they do the connection

oles has occurred More usually the hemorrhage and necrosis progress relentlessly for a few days prior to death the clinical outcome during that time being quite unpredictable In addition to the local process of pancreatic destruction there is widespread fat embolization especially of the lungs

The remaining 10 per cent of cases of acute pancreatitis are characterized by progression to suppuration (*acute suppurative pancreatitis*) This may happen in the absence of fat necrosis Ordinarily the pathologic process is comparatively torpid and all of it remains rather well localized to the area of the pancreas Abscess commonly develops as time goes on This may persist as a circumscribed process which eventually develops into a pseudocyst or it may rupture out into the upper abdomen leading to spreading peritonitis The mortality rate is about 25 per cent

With subsidence and repair of the acute process whatever its severity some degree of chronic change is produced Repair is carried out mainly through fibrosis followed in the severer cases by calcification (Fig 207) Chronic fibrous pancreatitis not to be confused with mucoviscidosis is the final result or summation of sublethal attacks of acute pancreatitis Acinar activity may largely come to an end Destruction of all acinar tissue precludes further attacks of acute pancreatitis As long as acinar tissue remains the possibility of repeated acute episodes exists (*chronic relapsing pancreatitis*) One sequel in some cases is formation of pseudocysts Another is gradual destruction of the islet tissue followed by diabetes Diabetes develops in rough correlation with the amount of calcification which proceeds in the fibrosed pancreas Within a year of acute pancreatitis about 10 per cent of all patients are found to have some degree of pancreatic calcification on x ray study The incidence of calcification among patients with symptomatic chronic pancreatitis is approximately 50 per cent About 1 per cent of all diabetics have radiologically demonstrable pancreatic calcinosis and about half of all patients with calcification have diabetes overt or latent

FAR REMOVED EFFECTS AND COMPLICATIONS OF ACUTE PANCREATITIS

In the majority of cases the clinical and pathologic consequences of acute pancreatitis remain rather well localized to the pancreatic area When the process is severe however release of ferments through the peritoneal cavity with or without development of ascites commonly occurs Rupture of a suppurating abscess adds massive infection to the problem although secondary infection ordinarily develops in any case A plastic peritonitis results and this quickly causes loculation of fluid and pus into scattered abscess cavities If the patient survives the future usually holds in store months of intermittent bowel obstruction burrowing sinus tracts marasmus and the other abdominal and systemic miseries which go along with chronic peritonitis and low grade infection

Nephrosis is a common complication of severe acute pancreatic necrosis and renal insufficiency contributes to the death of about 10 per cent of fatal cases Kidney damage appears to be due to circulating enzymes toxic tissue products and fat embolization *Mental changes which develop in many* severe cases can be ascribed to the same factors Adrenal insufficiency apparently of *a toxic nature is a rare complication Adrenal* hemorrhage is probably a remote possibility

Pleural reaction pleural effusion and basal *atelectasis are potential complications* when ever the injured pancreas creates intraperitoneal collections of fluid (Fig 208) They are therefore not encountered in mild cases Either or both sides of the chest may become involved Fluid aspirated from the pleural cavity has like that from the abdominal cavity a significant amylase content With resolution of the pancreatitis the chest usually clears leaving only chronic diaphragmatic pleurisy Occasionally intrathoracic problems of very serious nature develop including chronic abscesses constricting pleuritis and bronchopleural and pancreaticopleural fistulas

COURSE OF LOCAL PATHOLOGIC EVENTS

The extent to which the pathologic changes progress in acute pancreatitis varies considerably from patient to patient The chances of spontaneous regression depend largely on how far necrosis has proceeded At the outset the mortality rate is less than 5 per cent In this small group with a quickly fatal outcome acute necrosis is regularly found at autopsy in spite of the absence of any degree of interstitial hemorrhage (*acute necrotizing nonhemorrhagic pancreatitis*)



FIG 207 Calcification of the head of the pancreas in patient with chronic pancreatitis The cholecystogram and the duodenal tube indicate near by relationships

the clinician can seldom judge which phase he is dealing with but after a few hours of observation the situation usually becomes clarified About three quarters of all cases go no further than the acute edematous or interstitial stage without hemorrhage (*acute edematous pancreatitis*) There may or may not be fat necrosis Spontaneous remission beginning within three days is the rule and

When hemorrhage is prominent the progression of necrosis is catastrophic (*acute necrotizing hemorrhagic pancreatitis*) Although only about 15 per cent of all cases of acute pancreatitis fit into this category the mortality rate is about 75 per cent This is an occasional cause of sudden death and when this happens autopsy shows that acute thrombosis of most of the pancreatic arteri

young people it is usually associated with mumps New acute pancreatitis seldom is encountered among the aged About one third of the pancreatitis patients met in hospital practice give a history of a previous attack

The history and physical examination by themselves do not often permit one to diagnose acute pancreatitis with assurance It is for this reason that interest in and study of the clinical manifestations must be kept at a maximum otherwise it is easy for the clinician to overlook the significance of the many seemingly nonpancreatic manifestations which may be the only evidences of illness Although the clinician cannot help but tire of hearing that every obscure disease can easily be diagnosed if only thought of perhaps the temerity to suggest the same in the case of this particular disease can be forgiven There really is no usual clinical picture in acute pancreatitis or none that can be identified with confidence Perforation myocardial infarction acute pelvic inflammatory disease vascular catastrophes and many other diseases may be simulated in every bedside d- ail

SYMPTOMS

Pain is by far the most important complaint In about three quarters of the cases its onset is sudden and its initial degree severe In the others it may gradually develop over a period of a few hours sometimes in fits and starts Many types of pain may be represented Whatever its severity and location it tends to be steady Perhaps sharp epigastric pain with some reference to the back is most commonly encountered Reference to the shoulders is infrequent Localization over the gallbladder area or the left upper abdominal quadrant is moderately common In about 10 per cent of the patients pain is limited to the hypogastrium and pelvis and about the same proportion have only chest pain Although once the pattern has become established it does not ordinarily change very much at the start bowel cramps may be superimposed upon it Unfortunately development of spreading peritonitis is not necessarily accompanied by alteration in pain distribution so no warning may be given In the usual case of acute edematous pancreatitis pain subsides after about three days The suppurative form tends to be much less dramatic in all its manifestations than the others but discomfort persists much longer In fatal cases of acute hemorrhagic pancreatitis the pain may show no evidence of remitting up to terminus and ordinarily it proves moderately resistant to narcotics

Persistent nausea with vomiting is a common complaint at the outset and through most of the course It is rare for the patient to have noticed blood in his vomitus Initially there often is diarrhea and although diarrhea continues in some cases constipation is more common after the first few days A small proportion of patients complain of chills Cough comes later

PHYSICAL FINDINGS

Examination usually reveals a patient who is desperately ill but one cannot assume that the severity of the physical findings parallels the severity of the underlying pathologic changes Early shock is not common and if it develops the prognosis is known to be very poor It is not observed in simple acute edematous pancreatitis Profound shock signals imminent death and when acute pancreatitis causes sudden death shock is apparently responsible Some degree of mental confusion or actual disorientation can be expected in about one third of all cases with the realization of course that some patients will merely be drunk If extensive fat necrosis has already developed hypocalcemic tetany may be observed at the initial examination Tetany is uncommon however and ordinarily does not appear until two or three days have passed Low grade fever is found upon initial examination in half the patients and later in about three quarters There is corresponding tachycardia In the suppurative form of pancreatitis the manifestations of acute sepsis may become promin nt after a few days

Abdominal inspection suggests minor distention but usually little else If selective

Many interesting hemostatic changes go on in acute pancreatitis These are not well understood They include both intravascular clotting and hemorrhagic effects in the same patient Alterations in the antithrombin level prothrombin concentration thrombocyte count and other factors have been recorded

CLINICAL ASPECTS OF ACUTE PANCREATITIS

In general hospital experience approximately one per thousand admissions is for acute pancreatitis Autopsy figures indicate that acute pancreatitis accounts for about 0.4 per cent of adult deaths There is a

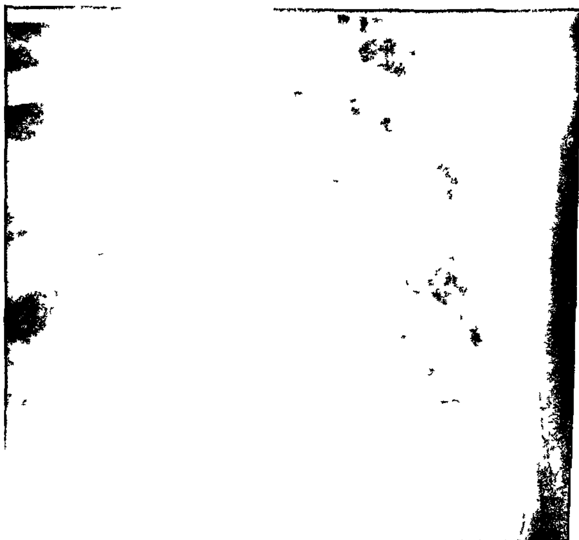


FIG 208 Pleural calcification which developed eight months following acute pancreatitis which was complicated by left pleural effusion

but it is difficult to formulate characteristic patterns Gross bleeding from the gastrointestinal tract occurs in about 5 per cent of patients but rarely is this sufficient to prove a *problem* Superficial thrombophlebitis which occasionally develops in patients with considerable pancreatic *necrosis* is believed to be caused by circulating enzymes

minor preponderance of men often ascribed rather fancifully to the presumption that the excess of alcoholism among men is greater than the excess of gallstones among women There seems to be no racial predisposition At the time of their first attack most patients are in the third or fourth decade of life When acute pancreatitis is encountered in

amylase determinations The amylase level must be high to be significant Provocative tests to boost it have no clinical usefulness Most laboratories consider 200 Somogyi units to represent the upper limit of normal but this figure means nothing for diagnostic thinking Unless a level of at least 600 or 800 units is found one cannot assume that he has obtained confirmation of a clinical diagnosis of acute pancreatitis This raises problems for amylase retention is an ephemeral matter When the disease is acute pancreatitis and laboratory study fails to demonstrate hyperamylasemia the explanation is almost always that blood was not drawn at the optimum time Although a sample drawn at one moment may unequivocally confirm the diagnosis one taken only a short while before or after may show an unimpressive level The most important part of any decision to study the serum amylase level is to arrange for a determination every two hours beginning immediately until the course or tendency of the successive levels becomes clear

The amylase *content of the urine parallels* that of the blood Urinary excretion of more than 900 Somogyi units per hour is always accomplished during the active phase of acute pancreatitis Amylase concentration in ascitic fluid and pleural fluid is high during the period of active disease and it remains so considerably longer than does that in the blood Occasionally in obscure cases of acute pleural effusion astute clinical intuition leads to testing of material obtained by pleural tap for amylase and the diagnosis of pancreatitis is immediately made

Leukocytosis is observed in about three quarters of the patients It often does not appear for a day or more after the onset of symptoms and ordinarily does not reach high levels The leukocyte count does not help either diagnosis or evaluation The results of antithrombin tests have considerable investigational interest but are too erratic to help the clinician

Determination of the serum calcium level is of value in judging the degree of fat necrosis It may fall to a remarkably low point at any time between the first and tenth day usually between the second and fifth and this is an indication of severe disease Electrocardiographic study frequently shows abnormality in acute pancreatitis and hypocalcemic prolongation of the Q T interval and flattening of the T waves are a good part of it adulterated perhaps by other electrolytic imbalances

During the acute stage of the disease only minor abnormalities appear in the liver function tests In some patients of course liver disease has existed prior to the onset of acute pancreatitis and new changes are difficult to evaluate Bilirubin retention of mild degree is fairly common An interesting transient phenomenon is increasing bromsulfalein retention during the period of pancreatitis resolution

Hyperglycemia develops in most patients during the first few days of illness This is not prophetic of permanent damage to the islet tissue the possibility of eventual development of diab tes cannot be judged during the acute phase of the illness

ROENTGENOLOGIC FINDINGS

There are no roentgenologic signs to prove acute pancreatitis but a few diagnostically helpful nonspecific changes are encountered in some cases The sign of the sentinel loop which can be demonstrated at some time during the first week in about half the patients is the best It is secondary to peritonitis in the upper part of the abdomen Upon plain film study a short stiff appearing segment of small intestine which is well distended with gas is found near the center of the abdomen Except for the sentinel loop there is little gas in the bowel Although from time to time the magenblase may be large vomiting ordinarily keeps the stomach empty of gas too Other changes sometimes seen are a small stationary gas bubble in the duodenal bulb duodenal atony occasionally atonic ileus ill defined left psoas shadow and partial paralysis of the left leaf of the diaphragm One usually does not care to carry

dilatation of the transverse colon (Gerbich s sign) should be detected it can be considered suggestive evidence of acute pancreatitis Mild and transient jaundice develops in approximately 15 per cent of the patients due to common duct obstruction by the edema of near by or encircling pancreatic tissue Cyanosis is sometimes observed apart from the shock stage

If Grey Turner s or Cullen s sign is found a great deal of diagnostic help is obtained but they are not common The former consists of an area of skin discoloration over each flank and the latter is discoloration of and around the umbilicus The skin over a variable area turns the colors of a resolving bruise—red blue green and yellow The signs signify that extraperitoneal blood with or without pancreatic secretion has made its way around to the lateral or anterior abdominal wall and has penetrated the tissues to the subcutaneous stratum Blood probably reaches the umbilical area via the falciform ligament Neither sign is of course specific for acute pancreatitis as the source of extra peritoneal bleeding Thomas S Cullen described his for ruptured ectopic pregnancy

Abdominal palpation gives information which is notoriously misleading to the examiner who is attempting to localize the source of disease and to judge the degree of peritoneal irritation Unless the patient is comatose tenderness is always found It often seems to be diffuse over the whole abdomen and perhaps the pelvis as well In less than half the patients is there rebound tenderness and then it is likely to be reflected over a large epigastric area Strangely muscle guarding of significant degree is found in only half the patients and hard spasm of the abdominal wall is unusual Instead of rigidity the abdomen characteristically has a doughy feeling somewhat like that expected in tuberculous peritonitis Because acute cholecystitis is rather often associated with acute pancreatitis special thought must be given to the meaning of tenderness which is found over the gallbladder area

Examination of the lungs reveals basal crepitant rales in about one quarter of the patients Occasionally pleural fluid is found on one or both sides Any obscure acute abdominal problem in which pleural effusion develops may turn out to be pancreatitis A pleural friction rub can rare y be heard

Peripheral thromboembolic phenomena are encountered in some patients whose disease includes a fair degree of pancreatic necrosis

LABORATORY FINDINGS

Although bedside impressions must necessarily stop short of a specific conclusion the diagnostic gap can be filled satisfactorily by laboratory study of circulating amylase and lipase concentrations Some of the factors which hinder the usefulness of the enzyme tests have already been mentioned When the problem is diagnosis of abdominal pain there are three major interpretational dangers primary disease elsewhere may irritate the pancreas and increase the serum s enzymatic activity many drugs commonly used to treat acute abdominal pain may do the same and this is a fleeting laboratory abnormality which may easily be overlooked if not tested at a favorable moment in the disease s course

During the stage of early activity of acute pancreatitis duct blockage forces an endocrine route on a large proportion of the exocrine secretions and the levels of amylase and lipase in the blood may become very high Ordinarily serum amylase elevation reaches its peak within 24 hours of onset of symptoms and begins to recede as the pain decreases Because of the lag in its response the lipase may not have reached its own peak by this time In the great majority of cases the amylase concentration returns to normal within five days of the onset of clinical illness Rarely it remains high as long as 45 days fluctuating considerably meanwhile

Although the serum lipase level must not be de emphasized as an important diagnostic test especially when a patient suspected of pancreatitis is first examined rather late in the course of the disease in general the clinician is helped most by the results of serum

plasma It is known that plasma contains a natural antitryptic factor and because it appears to be carried in the albumin fraction some clinicians advocate administering as much as 500 ml of human serum albumin daily for five or more days It is questionable however whether a significant antitryptic effect is actually exerted and it seems likely that the value of plasma or albumin administration is simply that of effective restoration of the blood volume

Occasionally diabetes presents as a truly serious complication and if it does one can expect unusual resistance to insulin The other complications have been mentioned Therapeutically the most difficult are the chronic ones which follow dissemination of a suppurative process through the abdomen Keeping the patient in Fowler s position during the acute phase is said to help prevent some of the potential complications of peritonitis

Surgery is dangerous in almost all cases of acute pancreatitis but in spite of every diagnostic precaution pancreatitis is sometimes stumbled upon at laparotomy for some other suspected cause of acute surgical abdomen In addition to a very high postoperative mortality rate the postoperative course among survivors is likely to be difficult If the surgeon comes upon acute pancreatitis unexpectedly he usually drains the pancreatic area and closes the abdomen quickly In an occasional instance of acute hemorrhagic pancreatitis with spreading suppurative peritonitis this approach may actually improve the outlook considerably but this is not predictable prior to exploration When this form of the disease is encountered the purpose is to drain the lesser peritoneal sac and if the gallbladder is distended to perform a cholecystostomy Some surgeons believe that under these circumstances the common duct in addition to the gallbladder should be drained

CLINICAL ASPECTS OF CHRONIC PANCREATITIS

Pathologically chronic pancreatitis is a common condition which infrequently becomes responsible for clinical illness Its clinical importance seems to depend largely on three factors the degree of exocrine and endocrine deficiency it produces its propensity to relapse into recurrent episodes of acute pancreatitis and the amount of fibrous infiltration it produces through the great regional nerve plexi Pain and nutritional deficiency are the features responsible for the characteristic d bility of the chronic pancreatitis patient Chronic relapsing pancreatitis a clinical variation of the disease is at the start of subjective importance only when acute pancreatitis becomes superimposed on the quiescent chronic pro ess Prior to the initial firmly diagnosed acute episode spells of simple indigestion perhaps coming on only a few times a year may in retrospect be the only evidence to indicate that chronic pancreatitis had been developing It is not clear why some people have but a single episode of acute pancreatitis while others develop chronic relapsing pancreatitis but it is thought that some recurrent vascular influence plus possibly an obstructive factor may be at work As the acinar tissue becomes destroyed through repeated acute injury and chronic fibrous replacement the parenchyma gradually becomes burned out and acute recurrence is then no longer possible Somewhere towards the end of the progression fibrosis in and about the pancreas becomes extensive enough to produce constant pain

Chronic relapsing pancreatitis may then present several clinical phases depending on amount of pancreatic destruction which has occurred At the start the patient s weight is normal there is no diabetes and no bowel problems In the beginning each acute attack which is often set off by an alcoholic episode is characterized by severe manifestations Between attacks the patient feels and appears well With the passage of time the successive relapses tend to become less severe Hyperamylasemia and hyperlipasemia become less and less marked and eventually they cannot be demonstrated Examination of the abdomen shows a variable degree of tenderness and little else unless a pseudocyst has developed With further progression weight loss becomes an outstanding manifestation Diarrhea seems at first best explained

out contrast study during the acute phase of the disease but if he should he might find elevation of the stomach and duodenal bulb widening of the duodenal loop either spasm or atony of the duodenum and jejunum coarsening of the small intestine mucosal *pattern and spasm of the transverse colon* and splenic flexure

Cholecystography often fails to produce opacification of the gallbladder for two or three weeks following acute pancreatitis even though the biliary tract is normal This is an important point in view of the fact that the *biliary tract must be evaluated after* pancreatitis has subsided so that prophylactic therapy can be planned

TREATMENT

As mentioned above the mortality rate for acute pancreatitis is not inconsiderable *In addition to the pancreatic disease itself* however associated disease seems to have an unusual degree of influence over the outcome and for this reason it is particularly important that treatment be geared to the whole patient problem Thus patients with portal cirrhosis often become dangerously ill even when pancreatitis goes no further than the acute edematous stage and the same is true to a lesser degree of patients with chronic renal disease and severe emphysema

It is a good plan as far as possible to manage the pain by sedation using perhaps a *parenteral* barbiturate or paraldehyde Quite obviously strong analgesia is required in many cases during the early part of the course but the change to sedation should be carried out as soon as practicable The point *is that all of the analgesic agents which are* effective enough to be useful discourage drainage of the pancreatic ducts through their spasmogenic effects Although this is only a theoretical objection all clinicians agree that the natural opiates especially morphine should be avoided Sometimes it must be admitted pain is of such severity that they cannot be Demerol appears to possess relatively weak spasmogenic—not spasmolytic—influence over the sphincter of Oddi and it is the analgesic of *choice* Although epidural and other forms of neural block for relief of pain have been advocated from time to time their usefulness is very limited and they cannot be recommended

Continuous gastric suction during the first few days of illness is important not only because it furnishes symptomatic help for nausea and vomiting but also because passage of gastric acid into the duodenum is a potent stimulus for pancreatic secretory activity Nothing is permitted by mouth of course during the acute active stage of the disease

Use of an anticholinergic drug such as Banthine is *theoretically* beneficial as a gesture towards blocking neural influence over *pancreatic secretion Similarly control* of volume flow at the cellular level through use of a carbonic anhydrase inhibitor such as Diamox should be helpful The effectiveness of these two approaches is very difficult to *evaluate probably they should be used*

The threat of secondary bacterial infection and suppuration within the abdomen and chest must be met by active antimicrobial prophylaxis Penicillin and the sulfa compounds are rather well excreted by the pancreas while streptomycin and Aureomycin are not Whether this is *important* in selecting a drug for prophylaxis is not certain but penicillin has proved entirely satisfactory in large numbers of cases

Perhaps the most difficult aspect of therapy is management of fluid and electrolyte deficiencies *In acute pancreatitis* there is a remarkable degree of plasma loss into the retroperitoneal space and sometimes there is intraperitoneal fluid loss as well Vomiting and constant gastric suction contribute a familiar type of fluid and electrolyte problem The needs are met as dictated by the usual clinical estimations measurement of urine volume and specific gravity hematocrit blood chemical determinations etc *Special attention* must be given to hypocalcemia and potassium disturbances Ordinarily the blood contains an excess of glucose and because of the transient diabetic tendency it is just as well not to add to the hyperglycemia in replacing fluid Physiologically the most correct material for fluid supplementation is blood

with 3 gm of pancreatin with each meal and then increase the amount rapidly judging effectiveness by the gross appearance of the stools The oral use of papain in addition to pancreatin may be helpful although the main problem is effecting adequate fat not protein digestion

Chronic severe pain cannot be considered a problem for medical therapy Usually it is too much for simple analgesia especially during periods of clinical exacerbation The danger of narcotic addiction in this group of patients becomes very great By the time the severe pain of chronic pancreatitis presents itself pharmacologic worry over inducing sphincter spasm becomes inconsequential but the addiction problem that scattered doses of narcotics create is very difficult It is all very well to point out and to accept the danger as reality but when faced with a patient in severe pain against which all other drugs are useless it is difficult for the clinician to maintain resolute principles This must surely be the explanation for the frightening fact that approximately 60 per cent of patients with painful chronic pancreatitis become addicted to narcotics

History of the surgical approach to the pain and relapsing of chronic pancreatitis has been marked for years by a plethora of suggested procedures There can never be standardization of technic because of the many individual differences from problem to problem At the moment one of the difficulties is that as yet there has evolved no uniformity of thinking on the surgical physiology involved Relative ignorance over this makes it necessary for the time being to reserve surgical therapy for the patient whose disease clinically is judged to be severe either in the degree of pain displayed or the frequency of acute relapses Later it may be possible to make better prophylactic use of surgical technics but now there are no other indications for operation As mentioned whatever surgical attack is selected it should include cholecystectomy or other indicated biliary manipulation if biliary tract disease is present

Division of the sphincter of Oddi has proved to be one of the more successful procedures furnishing good help for about half of the patients with recurrent pancreatitis for whom it has been used It should probably be given first consideration when operative management is judged proper and the indication is frequent relapse Usually an incision 1 to 2 cm long is made through the distal end of the common duct the edges spread with absorbable sutures and a T tube left in place for a few days Operations which merely separate the biliary and pancreatic channels such as choledochoenterostomy are failures and one must suppose that sphincterotomy somehow accelerates pancreatic flow even perhaps when there is no common channel

Pancreatic decompression can be achieved by way of the ducts at the tail of the organ through caudal pancreaticojejunostomy Stones which may have formed in the ducts are removed at the time Experience with this operation is relatively limited and its value in preventing relapse cannot be judged

Many nerve operations have been devised in efforts to block the pain of chronic pancreatitis Celiac ganglionectomy and bilateral splanchnicectomy with or without sphincterotomy have been moderately succesful in some cases Because a certain portion of patients receive insufficient benefit from other surgical procedures and because without help they can only remain totally disabled radical pancreatectomy may occasionally be judged to be the best move

CALCIFICATION

The majority of pancreatic calcifications merely represent the final stage of chronic pancreatitis Even though a mere manifestation they deserve special mention because they may raise differential diagnostic problems This type of calcification is encountered under the age sex and situational conditions which are met in chronic pancreatitis By the time it appears the relapsing phase has passed in a portion of patients and fatty infiltration of the liver has commonly developed On the other hand it must be re

by simple reflex gastrointestinal hyperactivity but eventually steatorrhea becomes the obvious cause in about half the patients Creatorrhea parallels the steatorrhea Depending on the state of biliary tract disease jaundice may be evident at intervals during the illness

Pain the most important subjective manifestation is mainly epigastric or midabdominal in location It is often referred directly to the back and less commonly to the left hypochondrium Radiation to the shoulders is unusual unless chronic diaphragmatic or pleural complications have developed At the start the pain may be colicky or episodic but later it becomes constant with erratic exacerbations It may simulate biliary disease penetrating ulcer spinal compression and many other processes With severe pain persistent nausea and vomiting are very common If the pain clears vomiting usually does too

Diagnosis depends on evaluation of all the factors so far mentioned Quantitative evaluation of the severity of the process is just as important as the actual diagnosis There are no specific tests The nature of the pain history of relapses and weight loss are the important features in clinical diagnosis while diabetes creatorrhea steatorrhea and calcification and pseudocyst formation in the pancreas are the aspects which require quantitative evaluation Because a large proportion of patients are chronic alcoholics and many have personality disorders the clinician often finds that reliable historical information is difficult to obtain It is characteristic to discover that wife or friend gives quite a different picture of the illness from that of the patient Sometimes the pathologic diagnosis is made unexpectedly at abdominal laparotomy upon discovery of a ligneous pancreas frozen in position Although pathophysiologic diagnosis is far more important than knowledge of the mere morphologic state of the pancreas there sometimes is uncertainty over the possibility of pancreatic cancer Biopsy of the pancreas is therefore *indicated* when the opportunity presents itself but it is to be noted that in cases of carcinoma it is often found that the biopsy specimen contains only chronic fibrous tissue

TREATMENT

There is no gastroenterologic disease which requires more careful individualization in therapy than does chronic pancreatitis The needs depend not only on *the severity of the* problem at the moment but also on possible future eventualities The nutritional deficiency creates a familiar although especially difficult enigma for medical correction Treatment of accompanying diabetes offers no particular problems although at the start response to insulin may be very erratic Insulin requirements ordinarily drop to about 40 units daily if total pancreatectomy should be carried out for pain When gallbladder disease is present it must be eradicated Treatment of pseudocysts is discussed later The importance of vigorous psychotherapy cannot be overemphasized Whether it is ever possible to make a concrete contribution towards eradication of chronic alcoholism is problematical nevertheless efforts must be bent in this direction aided by the invaluable services of available social service agencies

Diet should be a full one Calories and all of the nutritional elements are needed One should not eliminate dietary items which the diseased pancreas seems unable to handle but rather he should supplement pancreatic exocrine function when there is deficiency This can be done with pancreatin a truly remarkable preparation but only if a sufficient amount is used The degree of pancreatic insufficiency *quite naturally governs* the supplemental needs but because this cannot be judged except by trial the decision to prescribe pancreatin must be made with the understanding that physiologic needs whatever they be will be met Sometimes this means that 30 gm must be given with each meal Pancreatin is an expensive preparation Doses which do not fully meet the digestive needs are disproportionally ineffective and no economy is effected by using less than the dose which trial and error indicates to be optimum Usually one may start therapy

responsible Splenic and portal vein obstruction are occasional *complications* but important portal hypertension is apparently rare Pyogenic infection occasionally develops within a pseudocyst

opacified stomach duodenum and colon (Fig 209) The stomach is displaced anteriorly A defect midway or higher along the greater curvature is sometimes produced *In other* cases the enlargement develops within the

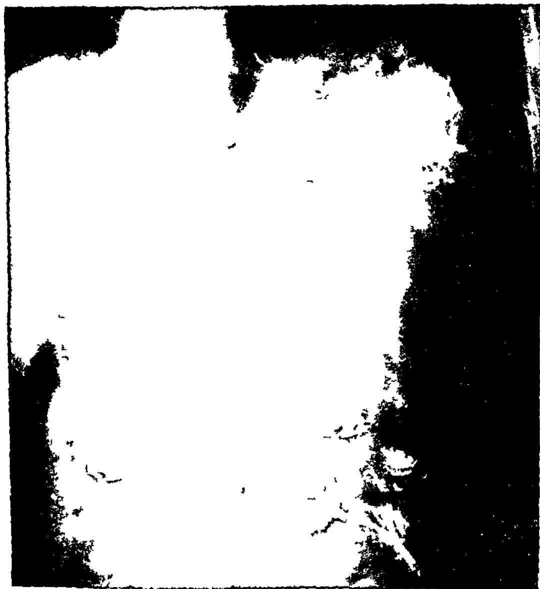


FIG 209 Deformity of stomach and duodenum secondary to a huge pancreatic cyst

There is ordinarily enough tenseness to render the lesions palpable as soon as they become large *enough to be felt* Roentgenologic detection and identification depend largely on pressure defects produced on the lesser curvature aspect of the stomach causing downward and left lateral gastric displacement with wide smooth enlargement of the lesser curvature The cysts may become calcified rendering diagnosis relatively easy

membered that in a few cases widespread diffuse calcification occurs rapidly after the first episode of acute pancreatitis Different observers have found that 5 to 50 per cent of patients with chronic pancreatitis eventually develop roentgenologically detectable calcification Because chronic pancreatitis is sometimes a disease difficult to diagnose and because its calcification is so easily detected roentgenologically it is not uncommon for diagnosis to be delayed until calcification appears Formation of calcium deposits does not alter the clinical manifestations of the underlying disease There are no new symptoms and no new signs other than the radiologic ones

Chemically the deposits which form in pancreatitis are composed largely of calcium carbonate and calcium phosphate Their radiopacity therefore depends merely on their size Because of the position of the pancreas they may be obscured by barium suspension during either upper or lower gastrointestinal fluoroscopy unless adequate oblique and lateral projections are used The calcifications tend to be distributed in varying sized agglomerations throughout the organ in concentrations approximating the thickness of the different parts of the organ When the pancreas is opened at autopsy the larger concretions are found to be discrete rough stones contained in dilated ducts and tight spaces out in the tissue The smaller disseminated deposits are irregular in configuration often displayed in thick plaques through the fibrous tissue

Development of calcification during the course of chronic pancreatitis rarely necessitates any change in plans for therapy and does not alter prognosis Rarely a large stone erodes its way out of the fibrosed pancreas to produce an internal fistula This may be accompanied by severe hemorrhage into the bowel

OTHER TYPES

There are certain other types of pancreatic calcification which are related to underlying disease In some cases of true pancreatic cyst particularly echinoccocal the wall becomes calcified appearing roentgenologically as a thin calcium ring or segment of its circumference with or without areas of central calcification True tumors areas of hemorrhage and infarcts may similarly become calcified The pancreas may be one of the organs involved in the disseminated calcinosis which accompanies certain parathyroid diseases

There is another group of cases in which it is difficult to find any relationship to underlying disease Here there is a solitary or sometimes a group of discrete stones in the major pancreatic duct Usually by the time the stone is found there has been considerable ductal dilatation secondary to obstruction Acinar atrophy eventually develops This is clearly quite a different process from the disseminated calcification of chronic pancreatitis Solitary stones of the duct of Wirsung are profitably treated by surgical pancreatotomy and removal

CYSTS

Most pancreatic cysts which become of clinical importance are the pseudocysts which sometimes develop in the course of pancreatitis secondary to inflammation and ductal obstruction They represent collections of liquid products surrounded by a fibrous sac without an epithelial lining In the great majority of cases they occur singly Any part of the pancreas or peripancreatic tissue may be the site of origin They may grow to a very large size even to filling the entire abdomen

Development of a pseudocyst usually does not alter the clinical manifestations of the pancreatitis and ordinarily diagnosis comes as a surprise during palpation or roentgenologic examination It is quite unusual to encounter a genuine pseudocyst in a person who does not relate a history at least suggestive of a previous episode of acute pancreatitis Persistent hydrothorax which follows acute pancreatitis in particular should stimulate search for a cyst It is sometimes said that a pseudocyst may cause jaundice but it seems more likely that intrinsic rather than extrinsic common duct obstruction is usually

origin of pancreatic carcinomas it is probable that approximately two thirds arise in the head The others are evenly distributed along the body and tail The great majority arise from the ductal epithelium and the rest are of either acinar or islet cell origin Compounded tumors are occasionally encountered Ductal carcinomas wherever located are usually dense and fibrotic although there are minor variations in the degree of cellular anaplasia They are rarely bulky and this is the main pathologic feature interfering with physical roentgenologic and surgical diagnosis As opposed to this characteristic scirrhous form acinar carcinomas occasionally form true medullary tumors

In addition to the usual dense fibrosis of the tumor itself carcinoma of the pancreas creates chronic pancreatitis which is responsible for more fibrosis Tumor growth blocks the ducts proximal to it and in addition to the pancreatitis which this produces there is retention cyst formation in about 15 per cent of the cases Fat necrosis and suppuration are rare Because of the diffuse and fibrotic nature of the pericancerous reaction it is often very difficult for the surgeon who is interested in taking a pancreatic biopsy to recognize the proper site for approaching the lesion

In about one quarter of cases studied at autopsy no metastatic lesions are found apart from the regional nodes and in many more the metastases had nothing to do with the fatal outcome In fact it is unusual for the prosector to conclude that metastases contributed in any significant way to death Throughout all clinical and pathologic dealings with carcinomas of the pancreas one becomes impressed with the fact that their local invasive propensities are very great and of course this is a region in which invasion can cause great harm Tumors of the body and tail invade farther and apparently more quickly than do those of the head This may not however be a true reflexion of the behavior of the carcinoma but may merely be due to the fact that the former lie in a relatively silent area and must extend before their presence is made known Carcinoma of the pancreatic head tends to invade the duodenal wall although only late does it penetrate the mucosa itself to initiate bleeding into the intestinal tract Submucosal infiltration of sufficient degree to produce duodenal obstruction occurs in no more than 5 per cent of cases Carcinoma of the body and tail more freely penetrates the hollow viscera causing earlier bleeding The transverse colon close to the splenic flexure and the posterior wall of the stomach often at the lesser curvature are most often involved In cases of gastric infiltration it is often impossible to decide from gross appearances which organ was the source of the cancer

Spread into the common duct is the usual explanation for the obstructive jaundice which so commonly accompanies carcinoma of the head It is likely that mere external pressure on the duct is not often the mechanism judging from the behavior of the jaundice Invasion ordinarily begins at some point along the extraduodenal course of the common duct so that jaundice often becomes well established before duodenal deformity can be demonstrated roentgenologically

Invasion of the veins of the portal system is common and this may lead to important complications The pancreas is of course in most intimate relationship with the splenic vein Once within the veins of the portal system tumor may obstruct locally or grow quickly up through the liver The resulting portal hypertension may be felt in only part of the system or it may be generalized If the hepatic veins become plugged the Budd Chiari syndrome develops It is not uncommon for this type of spread to produce a clinical picture which closely simulates that of cirrhosis with hepatomegaly splenomegaly ascites distended abdominal veins and esophageal varices

As soon as carcinoma of the body or tail breaks its pancreatic bounds it contacts the great autonomic nerve plexi of the upper abdomen the common explanation for the pain it produces Anteriorly the peritoneum is invaded Breaking through this the tumor may freely liberate cells to create widespread peritoneal implants Ascites sometimes hem

OTHER TYPES

Cysts which form following trauma to the pancreas are in reality pseudocysts secondary to localized pancreatitis This is the second most common form of pancreatic cyst and probably it and the pseudocyst of acute pancreatitis account for more than three quarters of all the lesions Traumatic cysts occur singly may become very large and may calcify

Simple primary retention cysts are rather difficult to think about because they must be considered to be the result of ductal obstruction and obstruction ordinarily leads to pancreatitis Retention cysts in some cases are no doubt true ductal cysts with a demonstrable epithelial lining but many suspected instances are probably really pseudocysts Stones tumors and extrinsic pressure seem to be the usual causes Occasionally very bizarre circumstances are encountered such as migration of an adult *Ascaris* up into the duct of Wirsung

Congenital pancreatic cysts are almost always associated with congenital cysts elsewhere as part of polycystic disease They occur as small and scattered lesions which rarely expand to any size Lindau von Hippel disease combines polycystic pancreas polycystic kidneys and hemangiomas of the retinas and cerebellum It usually manifests itself as a cephalic not abdominal disease Similarly in simple polycystic disease the pancreatic aspect is not likely to present a significant clinical problem

Parasitic cysts of the pancreas are very rare and only echinococcal cysts need be considered They are almost always secondary to hepatic hydatids

Neoplastic cysts likewise are rare Cystadenomas cystadenocarcinomas and teratomas are occasionally encountered Dermoids which have rarely been described may become calcified causing strange roentgen shadows

TREATMENT

Large solitary cysts require surgical treatment whether they are discovered upon routine examination or whether they are associated with symptomatic pancreatic disease Polycystic disease unfortunately is not amenable to any but supportive therapy When neoplastic and the other rare forms are encountered at operation the surgeon must do whatever procedure seems applicable to the problem as it presents itself

Pseudocysts ideally should be resected and those of the tail and body of the pancreas are approached with the hope that complete extirpation can be accomplished Unfortunately this is possible in only about a quarter of the cases A cyst cannot be removed without resection of the portion of pancreas to which it is attached and the technical considerations are many

Pseudocysts of the pancreatic head and often those of other parts are managed by permanent drainage and usually sphincterotomy is done at the same time Marsupialization through cystocutaneous fistula is no longer done because of the danger of persistence of the fistula and recurrence of the cyst Transgastric cystogastrostomy is usually considered to be the best procedure Cystoenterostomy with Roux Y anastomosis is sometimes chosen instead

ADENOCARCINOMA

To the gastroenterologist cancer of the pancreas means a disease which is common difficult to diagnose and impossible to cure In most autopsy series it accounts for about 2 per cent of all cancers and among city hospitals in this country for about one per thousand admissions It is a little more than twice as common among men than among women There do not seem to be well defined racial differences in susceptibility Although not excessively rare in late childhood and early adulthood the average age at the time of diagnosis is about 55 years and most patients are between 40 and 70 years of age These figures apply whatever part of the organ may be the site of origin

PATHOLOGIC ASPECTS AND LOCAL GROWTH TENDENCIES

Although it is difficult at both operation and autopsy to determine the exact site of

The matter of diabetes in patients with carcinoma of the pancreas is a particularly interesting one This cancer accounts for about 8 per cent of all malignancies among diabetics which is about four times the expected rate for the adult population as a whole Diabetes is then a common complication of pancreatic carcinoma being demonstrable in overt form in about one third of all cases as the course progresses It is secondary simply to destruction of the islets by tumor growth and the associated fibrosis Alpha and beta cells suffer equally and the diabetes is therefore rarely of more than moderate degree

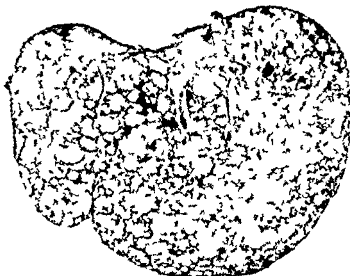


Fig 210 Extensive hepatic metastases from carcinoma of the pancreas

SPECIAL CLINICAL FEATURES OF CARCINOMA OF THE HEAD

The local growth habits which lead to specific symptoms and signs among patients with carcinoma of the pancreatic head are those of blockage of the common duct and invasion of the local nerve plexi The tumor does not have to extend far to accomplish these ends and the resulting jaundice and pain may appear while the mass is still relatively small The syndrome of Bard and Pic refers specifically to the clinical complex which results from the obstructive part of the picture In approximately 80 per cent of cases the jaundice is preceded by discomfort or actual pain Pain of severe degree comes first more often than does jaundice and occasionally jaundice never develops The intensity of jaundice may fluctuate considerably but not to the extent observed in carcinoma of the papilla of Vater If jaundice clears entirely it is likely that acholia has resulted from the obstruction Pruritis appears when bilirubin retention becomes marked

Pain of one sort or another is the presenting symptom and it eventually appears in almost all of the patients It has no especially typical characteristics being variable in type and location and often simulating that of ulcer gallbladder or irritable colon Usually however food does not have much influence over it Perhaps the most common pain can be described as more or less constant epigastric boring and often radiating directly through to the back Constancy severity and the tendency to radiate increase as time passes In a portion of the patients this type of pain comes only in severe paroxysms with periods of near complete relief in the interims Crampy epigastric pain much like that of biliary colic is moderately common and in fact usually it actually is biliary colic

If the pain of carcinoma of either the head

orrhagic is one sequel Local invasion of the left kidney and adrenal g and may occur later on usually without important clinical consequences Growth in the posterior direc tion is relatively restricted although late in the course there may be active destruction of the spine usually between T 10 and L 1

METASTATIC TENDENCIES

Unlike local invasion the hematogenous metastatic tendencies are about the same for carcinomas of all parts of the pancreas Some autopsy experiences are shown in Table 17

TABLE 17 METASTATIC TENDENCIES OF ADENO CARCINOMA OF THE PANCREAS AUTOPSY FINDINGS

	H ltl (9) (81 cases)	H alter R d S e (100 es)	C b ed
With metast ises	56	77	73
Liver	51	63	63
Pegional nodes	32	53	47
Lungs	21	27	26
Kidney	4	4	4
Adrenal	4	3	4
Bone	3	2	3
Myocardium	2	2	2
Spleen	1	2	2
Muscle	1	0	1
Skin	*1*	*1*	*1*
Ovary	1	1	1
Testicle	0	1	1
Colon	0	1	1
Prostate	0	2	1
Brain	0	2	1
Stomach	0	2	1
Supraclavicular nodes	0	2	1

Differentiation of metastasis from tumor in *vasion is sometimes difficult* The liver and lungs are by far the most important sites of metastasis and in fact other organs are only sporadically involved (Fig 210) It is sometimes said that carcinoma of the body and tail is likely to metastasize earlier than that of the head but there are too many variations from patient to patient to render this a useful rule Lymphatic spread to the nodes is of *course regional* to an erratic degree

THE GENERAL CLINICAL MANIFESTATIONS

Because of the different areas for invasion available to them carcinomas of the head and those of the body and tail are responsible for quite different local pathologic activities The clinical manifestations differ similarly for a cancer which is confined within the sub stance of the pancreas does not often pro duce symptoms and when it does these symptoms do not usually point to the pan creatic area It is necessary then to think of carcinoma of the pancreas in terms of two rather distinct clinical pictures

The manifestations which are common to all cases are those of the carcinoma more than they are of the organ affected The most characteristic feature of the clinical onset is its vagueness The duration of symptoms prior to their thorough investigation averages about four or six months Weight loss begins early in the symptomatic course and charac *teristically becomes severe rather rapidly* It can be said to occur to some extent in 100 per cent of patients This is due partly to the anorexia of the disease and partly to its wast ing nature Weakness is similarly part of the total picture A variety of dyspeptic symptoms may develop—belching food in tolerances and occasional nausea and vomit ing Rather often they appear first Non *specific colon complaints are very common* and in some patients they constitute the major subjective problem for many weeks Either diarrhea or severe constipation or sometimes both may be the complaint Schiff s dictum states that one should suspect carcinoma of the pancreas when the history suggests carci noma of the colon but study fails to confirm the impression Marked emotional disturb ances are common and it is not unusual for them to be recognized and well evaluated sev eral weeks prior to suspicion of pancreatic disease

Carcinoma of the pancreas whatever its site or origin characteristically causes no or little anemia unless erosion into the gastro intestinal tract has led to significant bleeding This may prove to be an important diagnostic consideration As with cancer anywhere in the abdomen appearance of fever leukocytosis and elevated sedimentation rate during the course of illness usually indicate that metas tases have developed

hepatic metastases The fully developed Budd Chiari syndrome is sometimes produced Exfoliated tumor cells may gain access to the pleural cavity through the diaphragmatic lymphatic system and lead to pleural implants and effusion The latter may be bloody The same course of events may rarely develop within the pericardium

The occurrence of venous occlusive disease (Trousseau s sign) in patients with carcinoma of the body and tail of the pancreas has possibly been over-emphasized to some extent as a diagnostic tip-off but when it is present it can be helpful By the time of diagnosis venous disease can be recognized in approximately 20 per cent of the patients It shows an increased incidence among patients with carcinoma of the head of the pancreas and those with other abdominal malignancies but most often it is associated with carcinoma of the body and tail Some patients present themselves with occlusive venous disease of the legs long before the presence of an abdominal problem becomes apparent a warning with which the peripheral vascular specialist is well acquainted The mechanism is not known but there is considerable evidence to suggest that an alteration in blood trypsin activity is responsible Thrombophlebitis and simple phlebothrombosis are the pathologic processes They are often migratory and multiple and sometimes a large number of veins are involved Pulmonary embolism is an infrequent sequel Spontaneous arterial thrombosis sometimes occurs

While some patients develop vascular occlusion others show hemorrhagic tendencies The explanation seems to lie in alterations in various abnormal and normal circulating enzymes and other factors such as the antithrombin titer vitamin K production fibrinolytic enzymes fibrin utilization factors etc Purpura epistaxis hematuria and gastrointestinal bleeding are the main manifestations Esophageal varices and tumor invasion into the gastrointestinal tract are the usual causes for severe bleeding in carcinoma of the pancreas but the possibility of a systemic hemostatic fault also exists

LABORATORY ROENTGENOLOGIC AND PATHOLOGIC INVESTIGATION

There are of course no specific tests for cancer of the pancreas but the combination of clinical suspicion and certain objective studies sometimes permits a reasonably reliable diagnosis without operative exploration by the time the symptomatic course has become established Certainly clinical suspicion is the more important It is an unusual pancreatic tumor which is stumbled upon during study for some other suspected disease It is true that in the hands of enthusiasts a precise diagnosis has occasionally proved possible through cytologic study of duodenal aspirates but to date exfoliative cytologic technics have not permitted hope that an answer has been found to the problem of early diagnosis of pancreatic cancer

Laboratory investigations are of help for general evaluation but not for diagnosis No additional comment need be made regarding study of the jaundice and detection and evaluation of secondary diabetes Measurement of pancreatic exocrine activity has no value but simple recognition of steatorrhea may suggest the need for supplemental therapy Steatorrhea develops in only about 10 per cent of the cases partly perhaps because food intake is so poor The circulating pancreatic enzymes are variable in their concentration tending to be moderately elevated early in the course and then subsiding to normal or low levels For the first month or so of illness the blood antithrombin titer may be elevated Accompanying biliary and portal obstruction important degrees of hypoprothrombinemia and thrombocytopenia may develop If looked for permanent achlorhydria will often be found. The stools contain no blood and there is no anemia early in the course unless there has been a bleeding complication Appearance of leukocytosis and elevation of the sedimentation rate often indicate that metastasis has developed

The roentgenologic signs have been mentioned at the beginning of this chapter They depend on tumor infringement on or pressure

or the body and tail can be said to have a useful diagnostic feature it is that of aggravation by posture In some patients the supine position regularly intensifies pain This plus the cancer patient s characteristic fear of the darkness makes each night an interval of special misery Very often sitting forward relieves the patient considerably Thus a suggestive postural attitude noticeable from the end of the ward evolves any patient with abdominal complaints who chooses to sleep bending forward in the sitting position can be suspected of having pancreatic carcinoma

Upon physical examination variable degrees of inanition and jaundice are found At the outset a pancreatic mass can rarely be palpated Later on either a pancreatic mass or a mass of regional nodes enlarged by tumor can often be outlined It must be recalled that retention cysts develop in about 15 per cent of the cases so that a palpable pancreatic mass is not always tumor By the time of death the gallbladder has become palpable in approximately 80 per cent of the patients in accordance with Courvoisier s law Unfortunately at the time the patient first reports for examination this sign is far less commonly encountered Depending on the degree of biliary obstruction and the presence of hepatic metastases the liver may or may not be enlarged Ascites and peripheral phlebitis may be found but these features are far commoner in carcinoma of the body and tail

SPECIAL CLINICAL FEATURES OF CARCINOMA OF THE BODY AND TAIL

Pain is also the primary symptom of the patient with carcinoma of the body or tail Frequently it is the sole manifestation for several weeks or it may be associated with the nonspecific dyspeptic or bowel symptoms already mentioned Weight loss is likely to be delayed for a while although once it begins it usually progresses rapidly Similarly although about 50 per cent of the patients develop jaundice towards the end of the course this comes too late to help with initial diagnosis Frequently then pain is the main or only feature that the clinician has to work with at the start The characteristic type of *pain is* situated in the epigastrium or a little to the left of the epigastrium It is deep pain constant dull and moderately well localized It tends to fluctuate erratically It sometimes is aggravated by meals contributing to the anorexia which regularly develops There may be radiation directly through to the back but more often radiation is towards the left hypochondrium and from here to the back Rather often the patient is able to describe the behavior of the pain in precise terms early in the course but just as often he cannot later on As in the case of carcinoma of the head there is a characteristic tendency for aggravation when the patient is lying supine and relief when he sits bending forward Examination usually does not show much tenderness over the painful pancreatic area Rarely can a mass be palpated until late in the course

The matter of back pain requires special comment because some patients for weeks or months have no other symptom or sign of pancreatic cancer except perhaps neurotic behavior This is a difficult diagnostic combination By the time the patient is referred to the gastroenterologist often a myelogram will have been done and sometimes laminectomy for removal of a nucleus pulposus will already have been carried out The myelogram sign of merely finding myelography films among the patient s x rays should direct some thought to the pancreas

Because of the frequency of peritoneal implants and the growth of tumor out through the portal venous system the presenting complaints may be very much like those of the cirrhotic patient Secondary phlebothrombosis of the portal system may produce the same misleading picture Enlargement of the abdomen edema of the legs and sudden hemorrhage from esophageal varices are among the possibilities Examination in such cases shows ascites splenomegaly often hepatomegaly and distended abdominal wall veins It is important to note that hepatomegaly in association with pancreatic carcinoma does not by any means always indicate the presence of

notoriously unreliable for proving the absence of pancreatic carcinoma This is partly due to difficulties in interpretation especially upon frozen section technic but the important problem is that fibrosis of noncancerous portions of the pancreas leads to misdirection of the biopsy knife or needle It can be predicted that operative biopsies will include only fibrous tissue in about one quarter of the cases in which later cancer is proved to be present Some experienced pathologists believe that the diagnosis of cancer can justifiably be

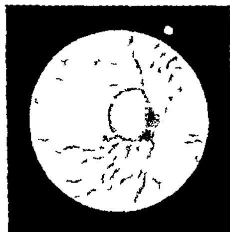


FIG 212 Gastroscopic view in case of carcinoma of the body of the pancreas The presence of the tumor could be recognized because of the inward displacement of the posterior gastric wall as shown here

assumed when the specimen contains fibrosis with certain histopathologic characteristics It should be noted that some surgeons prefer not to take pancreatic biopsies either by knife or by Vim Silverman needle because of the possibility of creating a pancreatic fistula and of slightly altering the operative mortality rate in addition to the relative unreliability of the results

TREATMENT

There appears to be no way at the present time to cure carcinoma of the pancreas There are scattered reports of five year survivals following radical extirpative procedures which involve removal of the pancreas spleen duodenum stomach parts of the portal venous system etc The operative mortality rate of surgical procedures which are designed to cure has varied from 12 to 50 per cent in most reported series The average survival time of patients who withstand the operation is only about a year Death is due to cancer recurrence and it appears that by the time diagnosis is made even the most extensive procedure is unable to eliminate all of the tumor At this time it must be concluded that attempts at radical extirpation cannot be recommended because they harm more patients than they promise to help Radiation therapy similarly has no place in the treatment of pancreatic carcinoma

There are some areas for active therapy in most cases beyond the usual opportunities for nutritional support analgesia emotional help etc At the time of the operation which is often carried out for definitive diagnosis every effort should be made to circumvent common duct obstruction which may already have developed or which promises to be imminent as judged by the location of the growth If the gallbladder is present this is easily accomplished by cholecystoenterostomy or cholecystogastrostomy Later in the course some patients require vitamin K supplementation and those who develop steatorrhea may benefit from pancreatin Diabetes requires ordinary diabetes management Although severe diabetes is an unusual complication of pancreatic cancer the mild or moderate form which usually develops often behaves erratically and is difficult to control as closely as one would like The complication of important bleeding from esophageal varices or from invasion of the gastrointestinal mucosa rarely justifies radical efforts to eradicate the bleeding lesion not only because of the seriousness of the basic disease but also because local tumor growth usually prevents the necessary surgical manipulations

OTHER TUMORS

Compared with adenocarcinoma other primary pancreatic tumors are rare Secondary tumor involvement however is moderately

against areas which can be opacified the splenic vein during splenoportography the duodenum and stomach the left kidney and the colon (Fig 211) Although sometimes a small tumor of the head produces a recognizable duodenal deformity roentgen study gives *helpful diagnostic information* in no more than one quarter of the patients at the time of initial examination In particular widening of the duodenal loop is not a useful early sign If gallstones should be found at the start of study there is a certain danger that they will be considered acceptable as the explanation for illness Sometimes the roentgen effects of pancreatic cancer on other organs suggests primary disease elsewhere This is especially true when the tumor actively invades the stomach or colon The diagnosis of primary carcinoma of the stomach or of the splenic flexure may seem assured from the radiologic findings Gastroscopic study can sometimes help in differentiating between primary gastric carcinoma and secondary invasion from the pancreas (Fig 212) Detection of a pancreatic mass in the absence of gastric invasion is another responsibility of the gastroscopist

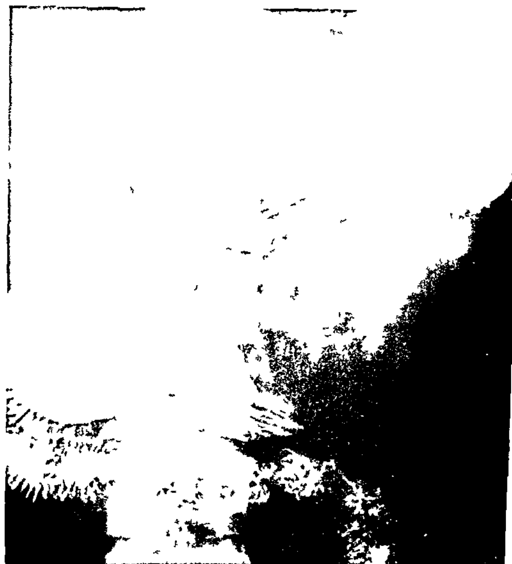


FIG 211 Deformity of stomach secondary to carcinoma of tail of pancreas

Biopsy specimens removed at operation are

logic means of judging whether a tumor has been physiologically functional either Appearance and arrangement of the cells are often entirely similar to those of the normal islet Microscopically there is not the encapsulation which the gross appearances suggest

Islet-cell tumors which behave as carcinomas tend to spread to the lungs liver spleen brain kidneys adrenals skin bone and myocardium In occasional cases growth is very rapid and metastasis early The metastatic lesions may be functional

The clinical manifestations depend almost entirely on the physiologic activity of the tumor therefore if symptoms and signs develop they are those of hyperinsulinism and psychic aberrations In most instances the clinical onset is slow and the patient for a while is not sure just how he feels or where he feels badly The course is progressive but episodic Fatigue and mental depression are ordinarily the first concrete complaints Nervousness and inability to concentrate during hunger periods or following exertion develop after a variable interval and eventually an outspoken attack of hypoglycemic convulsions supervenes The problem may then immediately become clarified but more often the clinical picture is not quite so clear-cut Whipple's triad forms a useful basis for evaluation the patient has attacks of weakness dizziness flushing amnesia or actual coma coming on during physiologic starvation or following muscular exertion there is relief with food or intravenous glucose and the blood sugar level falls significantly during an attack Unfortunately there is no constant pattern to the glucose tolerance test but a 6-hour test can be expected to give a fair evaluation of the efficiency of the sugar regulating apparatus Prolonged fasting up to 72 hours is a better diagnostic test but it is a strenuous one

Surgical exploration of the pancreas is called for whenever reasonable clinical suspicion exists For the common nonmetastasizing variety of tumor surgical extirpation cures When functioning islet tissue has metastasized through the body—which may not be recognized until after the primary tumor has been removed—treatment can only be directed towards meeting sugar requirements Chemical measures for subduing islet-cell activity as by alloxan have not proved satisfactory

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common Hematogenous metastasis to the pancreas is a random process there being no primary tumor which seeks the organ out and probably none that shuns it The pancreas is more often involved through contiguous invasion than any other abdominal organ because it is surrounded by structures which are vulnerable to malignant change Cancers of the stomach duodenum colon liver gall bladder biliary ducts adrenals and kidneys do not have to spread far before they encounter the pancreas

Approximately 1 per cent of primary pancreatic carcinomas are of the squamous cell type They probably spring from areas of squamous cell metaplasia in the duct system and seem to behave like adenocarcinoma in most respects

Primary sarcoma of the pancreas is rare Several types have been reported notably fibrosarcoma and lymphosarcoma Cystic forms are occasionally found Autopsy of patients with Hodgkin s disease reveals that the pancreas is involved much more often then clinically suspected usually through diffuse invasion from peripancreatic lymph nodes

The most common benign tumor is the islet cell adenoma discussed below The cyst adenomas which are usually benign and usually occur in women come next They are multilocular tumors containing either clear or brown hemorrhagic fluid and ordinarily they are quite bulky when discovered A small number of fibromas discrete lipomas angiomas and a few other forms have been described Most have been discovered unexpectedly during autopsy

Lipomatosis of a form which may properly be considered tumorous occasionally develops in the pancreas Lipomatous pseudohypertrophy is the term applied when massive amounts of fat grow within the pancreas It seems to be a primary disease and is encountered in both children and adults It causes atrophy of the acinar tissue without producing important injury to the islets The result is pancreatic insufficiency without subjective symptoms referable to the pancreatic area

Simple lipomatosis of the pancreas is a different process and has no clinical importance Here there are merely increased amounts of fat through the interstitial tissue Lipomatosis is commonly found at autopsy when there is obesity diabetes or chronic pancreatitis

ISLET CELL TUMORS

Adenomatous neoplasia of the pancreatic islets may prove to be either a benign or malignant process and in either case the result may or may not be hyperinsulinism Its autopsy incidence is approximately 0 1 per cent Illness ascribable to the tumor occurs in only about 15 per cent of affected people the lesions in the rest being merely small islet masses which as far as insulin production is concerned are physiologically nonfunctional or hypofunctional There is no sex preferential and diagnosis may be established at any age from the neonatal period through old age The majority of the tumors are discovered during middle life

Most islet cell tumors develop in the pancreatic tail but any part of the organ may be involved and in about 10 per cent of the cases there are multiple scattered lesions As many as 10 may be present Occasionally an islet cell tumor may develop in an aberrant pancreatic rest in the duodenum or stomach Usually the lesions form deep within the gland proper and thus are difficult to find by palpation Most remain small although size bears no relationship to their physiologic activity Those which measure only a millimeter in diameter or a little larger may prove very active while relatively large masses may exert no influence over sugar metabolism Islet cell adenomas whether benign or malignant are discrete and usually appear grossly to be encapsulated They are dark red in color this being the feature which helps the surgeon most in locating them at operation

Approximately three quarters of the tumors which are responsible for symptoms behave as benign lesions The usual histopathologic criteria for malignancy do not apply development of metastases being the only indication of the malignant state There are no morpho

at least one written examination Detection of minor or early splenomegaly is the chief clinical concern and no physical finding creates more interest whenever internists meet over a patient Almost everyone has his favorite technic for palpating and percussing the spleen and perhaps this rather than organic vacillation is the explanation for the common bedside phenomenon of disagreement over the size of the organ

than another The route of metastasis is believed to be solely arterial

When the spleen becomes very large secondary mechanical effects on the gastrointestinal tract must necessarily occur although important symptomatic results are unusual The regularity with which splenic enlargement progresses in the lateral anterior and then medial direction across the anterior abdomen is one of the most predictable events

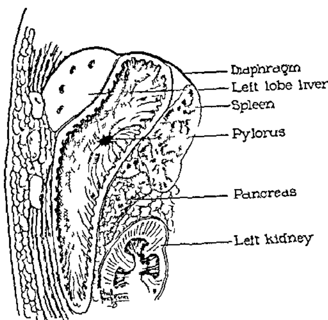


FIG 213 Relationship of the spleen to stomach pancreas and left lobe of the liver Sagittal section 5 cm to the left of midline

Among the many processes which are able to make an organ become enlarged that of metastatic tumor is conspicuous by its rarity as far as the spleen is concerned This striking clinical feature of the spleen its unaccountable refractoriness to metastatic growth is emphasized by autopsy statistics which show that splenic metastases are found in only about 15 per cent of patients who die of generalized carcinomatosis and in these cases the tumor nodules are characteristically small The primary lesion may be most anywhere—stomach bronchus uterus pancreas—and it is not possible to conclude that one type of cancer is more likely to involve the organ

in clinical medicine Even though the medial edge of the organ normally lies directly behind the cardia of the stomach pressure effects are not produced on this part Predictability of the direction of enlargement permits one to designate with assurance a certain pressure defect on the stomach s greater curvature as due to splenomegaly This and depression of the splenic flexure of the colon are the best roentgen signs of splenomegaly because they are least variable One should note for instance that although an enlarged spleen usually displaces the left kidney downward occasionally it elevates it

On a plain x ray film of the abdomen the

CHAPTER 19

SPLEEN

The spleen belongs to the hematologists and the general surgeons but not wholly The gastroenterologists have a valid claim if only because it lies in the abdomen and because Whoever arranged such things chose to connect it to the portal system The gastroenterologist will take a much wider interest in the spleen and its diseases than can be indicated in a book on gastroenterology The field of gastroenterology is necessarily a restricted one but the practitioner of gastroenterology cannot recognize the limitations of a sub specialty

CLINICAL MANIFESTATIONS OF CERTAIN SPLENIC ABNORMALITIES

Splenic diseases become of direct gastroenterologic concern when they cause pains or enlargements or roentgenologic features which may be confounded with the manifestations of gastrointestinal diseases Pain of splenic origin is due in most instances either to stretching of the organ s capsule or to inflammation of its serosa In addition there is the discomfort of mere size and weight when the spleen is greatly enlarged and the physiologic pain of hypoxia upon exercise during the postprandial period As one observes the symptomatic behavior of enlarging spleens he cannot help but be impressed by the variability of capsule stretch pain Often there is none even in acutely developing splenomegaly and one must wonder about the sensitivity of the capsule By no means however can acute splenic pain be ascribed to perisplenitis very often and it is necessary to realize that the behavior of pain of splenic origin must often seem inscrutable to the clinician

Splenomegaly is the result of a great variety of diseases Few doctors have received their degree without having to list them on

there is often a latent period before free rupture and hemorrhage Pathologically either a small tear is found at the splenic periphery or the initial injury is found to be a simple subcapsular hematoma One of the most important of pathologic features is that open lacerations of the spleen never heal spontaneously or at least no instance of posttraumatic scar has been reported at autopsy

Rupture of the spleen does not cause peritonitis in contrast to rupture of the liver and pancreas Different people react differently to blood in the peritoneal cavity —often there is little evidence of peritoneal irritation For this reason detection of the physical evidences of blood in the peritoneal cavity is the important thing The overlying tissues may appear to be entirely normal upon examination A friction rub can only occasionally be heard over the splenic area Blood near a ruptured spleen will clot and fixed dullness in the left loin and splenic region is usually found (Ballance s sign) It is said that dullness will always shift in other types of intraperitoneal hemorrhage Paralytic ileus occasionally may develop quickly in spite of absence of signs of peritonitis and then hyperresonance rather than flatness may be found over the splenic area Blood in this location is irritating to the underside of the left diaphragmatic leaf and somatic reference is made via the left phrenic nerve through C 3 and C-4 If the patient is placed in Trendelenburg s position pain is often produced at the left shoulder tip (O Connell s sign) When the patient complains spontaneously of this pain it is an important although inconstant symptom of trouble under the left leaf (Kehr s symptom) Sometimes pressure over the right lower abdominal quadrant produces left shoulder pain (Williams sign) In some cases pressure exerted between the left sternomastoid and scalenus anticus muscles produces pain (Saegesser s sign) Pressure on the right side of the neck is painless Spontaneous rectal pain with tenesmus is an occasional symptom due to blood on the pelvic peritoneum Tenderness on high rectal palpation is more common

Roentgenologically a mass or increased density may be found in the left hypochondrium The stomach is shifted towards the midline The left leaf of the diaphragm is immobile and may be elevated The most helpful roentgenologic finding is the Solis Cohen sign the stomach is dilated with irregular serration of the greater curvature and if the gastrolienal ligament has become infiltrated with blood the stomach is separated from the gas shadows of the colon

Diagnosis can usually be confirmed by aspirating the peritoneal cavity with a small needle Although the blood around the spleen clots elsewhere in the abdomen it remains liquid

Treatment requires splenectomy Blood replacement is usually the most important immediate problem the amount of blood which has been lost into the peritoneal cavity within a short time of injury is usually underestimated There is often a deceptive degree of homeostatic compensation to the blood loss until the peritoneum is opened at operation whereupon the blood pressure often falls suddenly Postoperatively left lower lobe atelectasis and acute gastric dilatation are threats Continuous gastric decompression is an important part of postoperative care

SPLENIC ARTERY ANEURYSM

Splenic artery aneurysm is uncommon but it is important because prior to rupture it is an easily curable condition while following rupture the prognosis is grave Recognition for prophylactic surgical extirpation is the responsibility and privilege of the gastroenterologist He may as well recognize the embarassing fact that the reason the obstetrician finds more than he does—more than anyone does—is that the obstetrician listens to the abdomen

PATHOLOGIC ASPECTS

The splenic artery is second only to the aorta as an abdominal site for aneurysm

apparent size of the splenic shadow, like that of the liver shadow may be most misleading If *roentgen confirmation of the clinical findings is desired* it is necessary to use contrast roentgenology of the surrounding hollow organs Although intravenous administration of thorium dioxide produces opacification of the spleen—leaving incidentally what may prove to be a confusing shadow if one is not aware of previous injection of the material—thorium is radioactive and because it is considered dangerous as a potential carcinogen *it is no longer used for this purpose* Satisfactory contrast views of the spleen may best be had by inflating the colon with air and administering an effervescent material by mouth High abdominal aortography permits visualization of the branches of the splenic artery thus demonstrating the spleen s size shape and position Aortography is however too drastic a procedure to justify its use for splenic diagnosis unless disease of the splenic *artery such as aneurysm is suspected*

RUPTURE OF THE SPLEEN

Because of the strange ways in which a ruptured spleen may behave clinically it is especially important that the gastroenterologist take an active interest in this surgical disease There is a notorious occultness to both the immediate clinical picture and to delay in posttraumatic hemorrhage from the organ and as a result the patient often consults an internist rather than a surgeon

It is said that the normal spleen may rupture spontaneously but after reading the reports one may feel that he prefers to remain rather skeptical It is clear that when the organ is affected with one of certain diseases however it becomes vulnerable to spontaneous rupture—acute malaria primary amyloidosis acute brucellosis and many others Infectious monoucleosis poses the important problem in differential diagnosis of spontaneous splenic rupture in this country It is responsible for most such ruptures but recognition of the complication is made difficult by the fact that symptomatic mesenteric lymphadenitis often accompanies the disease

The third variety of rupture is the syndrome of immediate rupture upon trauma to the normal spleen The spleen is the most commonly damaged abdominal organ when the lower chest or abdomen is subjected to nonpenetrating injury *Many common and* unusual accidents may be responsible Traffic injuries come first It is noteworthy that sledding injuries are unusually common among the causes Boxers seem strangely immune The blow usually involves the lower ribs on the left side The responsible force may however be applied anywhere over the abdomen It may appear in retrospect to have been rather trivial sometimes leaving no bruise on the skin and not even having knocked the person down

Finally there is the syndrome of delayed rupture of the normal spleen following trauma If it is understood that in some rare instances a spleen may rupture as long as six months after sustaining an injury the *main lesson of the disease has been learned* This is of course most unusual but in at least one of every seven instances of splenic rupture there is a dangerously misleading interval between trauma and rupture (period of Baudet) This may last only a few hours or more usually about a week For this reason in abdominal diagnosis it is a mistake to fail to respect a history of trauma in the recent past Sudden death from delayed splenic rupture occurring after an accident victim has been in bed a couple of weeks too often is assumed to be due to pulmonary embolism

The pathologic varieties of rupture may be classified in five categories Trauma to the splenic area may result in complete fragmentation of the organ with immediate severe hemorrhage If there is survival it may later be found that parasitic splenic implantation has developed through the abdominal cavity a condition known as splenosis Sudden rotation of the spleen may cause a tear at the hilus and again the result is immediate hemorrhage In the third variety one or more moderate sized tears are produced at the periphery of the organ Bleeding is likely to be slow but persistent In the last two types

sis and the aneurysm is not now understood

In most patients there has been in retrospect no symptom or suspicion of trouble until rupture occurs In others there is epigastric or left upper abdominal pain characteristically with bizarre radiations Physical activity regularly aggravates the pain and certain posturings may relieve it temporarily From time to time it may be mild or it may be agonizing Periodic nausea and vomiting may occur

Often rupture goes on in two stages The initial hemorrhage is small and stops spontaneously The blood usually enters the lesser peritoneal sac causing only a little pain and perhaps nausea Sometimes it leaks into the gastrointestinal tract and minor hematemesis or melena is the only sign After a day or a few weeks massive rupture occurs with sudden severe upper abdominal pain hiccups left shoulder pain vomiting quick collapse and usually death within a day Although in many cases the initial warning hemorrhage either does not occur or is not recognized as such sometimes there are three or four small leaks before actual rupture providing an opportunity for diagnosis If this should happen during pregnancy as it sometimes does it is easy to understand how its implications might be overlooked

The physical findings of uncomplicated splenic artery aneurysm may be so striking that routine abdominal examination permits a presumptive diagnosis This is of course rather unusual and it implies that the aneurysm is a large one The two physical evidences of the lesion are a systolic bruit and the presence of a mass Discovery of a bruit in the left upper abdomen upon routine examination is a fortune of clinical thoroughness and for the patient it is as lucky as the discovery of an asymptomatic curable cancer A bruit can be heard in most cases Some reviews of the subject do not seem to bear this out but a bruit will not be heard unless it is listened for and the intensity of the sound is sometimes muffled and difficult to distinguish from transmitted heart sounds A large aneurysm can be palpated and often the mass can be shown to be expansile in contrast to aneurysms of the abdominal aorta In about half the patients there is splenomegaly and this may interfere with deep examination Tenderness over the aneurysm is rather common

The physical findings do not permit one to judge accurately the artery which is involved by the aneurysm although statistically a left upper abdominal aneurysm must be presumed to lie on the splenic artery trunk For both diagnosis and localization roentgenologic examination is necessary Often a large annular calcification is found in the left upper abdomen with all the characteristics of a calcified splenic cyst Portions of sclerotic artery may be seen in the region High aortography is the most specific diagnostic procedure

Treatment is of course surgical extirpation with splenectomy It is fortunate indeed if this can be done as an elective procedure Following rupture treatment is the same but under these desperate emergency conditions the prognosis is very poor

SPLENIC CYSTS

Splenic cysts occupy a rather unique position among abdominal tumors because of the silent nature of most the large size of almost all at the time they are detected and of the relative impotence of clinical methods in diagnosing type following detection They eventually become important enough in their own right but they create as well problems in differential diagnosis Cysts of significant size are found in approximately 1 per cent of spleens which are removed at surgery

CLASSIFICATION AND PATHOLOGY

Discrete space-occupying splenic lesions comprise such a heterogeneous group etiologically and pathologically that formulation of a clarifying classification is difficult The specific neoplasms and granulomas are easy to understand because they are almost always secondary to obvious and more extensive disease elsewhere The solitary cysts on the other hand sometimes cannot be cate

formation The general autopsy incidence is about 0 08 per cent The main trunk of the artery is involved in about three quarters of the cases and its branches in the rest (Fig 214) There may be multiple dilatations By the time of diagnosis an aneurysm may be up to 15 cm in diameter Other occasional sites for aneurysm formation are the hepatic cholecystic celiac mesenteric and gastric arteries

The cause of aneurysm in most cases is simply arteriosclerosis The splenic artery may show severe sclerotic changes in the ab sence of clinically demonstrable sclerosis elsewhere and rather often a plain x ray film of the abdomen shows calcification and severe tortuosity of the artery when no clinical dis ease is present An interesting feature of splenic artery sclerosis is that it may develop in young people—sometimes during the teens and early twenties Mycotic aneurysms sec ondary to endocarditis and septic emboliza tion are considerably less common They may be multiple Congenital defects in the arterial wall are often discussed in connection with etiology but they are very difficult to prove Traumatic aneurysm of the splenic artery is a rare happenstance however it has been well popularized in connection with the death of President James A Garfield

Death from spontaneous rupture and hemorrhage is the eventual outlook for the untreated case About three quarters of the aneurysms rupture into the peritoneal cavity Less commonly they rupture into the retro peritoneal space or directly into the lumen of the stomach or colon Rare instances of rupture into the left pleural cavity pancreas and splenic vein have been reported



FIG 214 Splenic artery aneurysm anatomic relationships as they were encountered at operation

CLINICAL ASPECTS

Unlike most aneurysms those of the splenic artery affect twice as many women as men At the time of diagnosis most pa tients are in the fifth decade of life with a distinct tendency for women patients to be younger than men A wide age range from adolescence to old age has been reported In about half of the female patients diagnosis was established during pregnancy Although this has led to certain etiologic speculations it seems likely that thorough abdominal ex amination rather than hormones is the proper explanation It is notable that portal hyper tension is present in about 20 per cent of the patients Portal cirrhosis is the cause of the venous block in most patients but the sig nificance of the association between cirrho

sis and the aneurysm is not now understood

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gorized even after histopathologic study because the epithelial lining on which identification depends has degenerated One way to classify the types is as follows

- I Primary
  - A True cysts
    - 1 Infoliation
    - 2 Dilatation (polycystic disease)
  - B Degeneration
  - C Traumatic
  - D Echinococcal (very rarely primary)
  - E Dermoids epidermoids
  - F Neoplastic
- II Secondary
  - A Echinococcal
  - B Abscess
  - C Vascular
  - D Tuberculous

True cysts are considered to be of congenital origin although as is the case with most congenital cystic processes they may not make their presence known until late in life There are apparently two mechanisms of origin intrasplenic inclusion of a fold of peritoneum which eventually develops into an infoliation cyst and embryonic inclusion of whatever anlagen are necessary for the eventual genesis of polycystic disease These simple true cysts are so frequently discovered in women and during the child bearing age that it is possible there is some endocrinologic factor at work stimulating the embryologic rests It seems particularly significant that obstetricians are responsible for discovery of a large proportion of the lesions The contents of true cysts are ordinarily serous but there may be either secondary hemorrhage or infection

Degeneration cysts result from occlusive arterial disease or embolization They are often referred to as solitary hemorrhagic cysts Obviously only rarely do splenic infarcts undergo degeneration with cyst formation Such lesions never come to clinical attention unless they become very large or unless chanced upon at laparotomy Because the original lesion is an infarct and the progressive change is one of degeneration there is no true cyst lining It is interesting to note however that some pathologists believe it possible for an inner epithelial lining to develop in an occasional cyst of this type

It is the degeneration or hemorrhagic type of cyst which is responsible for production of most calcified solitary cysts This progression of pathologic events is uncommon but striking degrees of calcification have been encountered in young people as well as old The roentgenologic picture simulates that of splenic artery aneurysm in both shape and location a spherical rim of calcification is found in the left upper abdominal quadrant without identifying characteristics Upon resection the spleen is found to be largely cyst its parenchyma being stretched and compressed

Traumatic cysts appear clinically and pathologically very similar to degeneration cysts This is not unexpected for the first change is hemorrhage The distinction can properly be suspected only on the basis of a history of trauma The hemorrhage it is to be understood is subcapsular or deeper ruptured spleens do not go on to cyst formation The cyst contents are first hemorrhagic but later may become serous Calcification of traumatic cysts is less common in the spleen than in other tissues of the body

In only about 1 5 per cent of people infected with the larval stage of *Echinococcus granulosus* does the hydatid settle in the spleen More frequently splenic echinococcosis is the result of frank rupture or insidious leakage of a primary hepatic cyst This is not unexpected for the posthexacanth embryo would have to pass both the hepatic and pulmonary filters and then chance into the relatively small splenic artery in order to settle first in the spleen Malignant alveolar hydatid of the spleen is apparently almost always a secondary lesion The distinction between primary and secondary cysts is of course most important in carrying out surgical treatment Calcification commonly occurs after the cyst dies and the pattern of calcium distribution is helpful for specific diagnosis It is important to note that the size of the whole lesion may be considerably larger

than the area of calcification might suggest

The dermoids require no special comment Under the neoplastic cysts one need con sider only lymphangiomas and hemangiomas Tuberculous cysts result from excessive case ation plus hemorrhage Splenic abscess is a subject by itself

CLINICAL ASPECTS

When a splenic cyst becomes large enough to cause symptoms the patient usually com plains of left anterolateral lower chest dis comfort and anorexia Diaphragmatic irrita tion is an unpredictable manifestation A pleurisy like illness may come and go without apparent change in the splenic disease When splenic enlargement reaches a certain point which is not predeterminable the patient becomes conscious of weight and fullness Except for the presence of splenomegaly physical examination does not ordinarily give diagnostic help In some patients there is a persistent splenic rub and in others a rub can occasionally be heard

Roentgenologic studies may or may not suggest the presence of a cyst The size of the local organ displacing mass may be star tling The left diaphragmatic leaf is often fixed although not necessarily elevated The proximal part of the greater gastric curvature is indented Eventually the whole stomach is shifted to the right and the fundus anteriorly The colon s splenic flexure is frequently dis placed inferiorly a sign of considerable im portance Detection of calcification within the cyst although not necessarily permitting a specific diagnosis goes far to clarify the nature of the mass The main diagnostic dif ferential is aneurysm of the splenic artery

Unless they are of infectious origin or be come secondarily infected the majority of benign splenic cysts are important only be cause of their mass Those that cause symp toms should be treated if circumstances permit and this simply calls for splenectomy Echinococcosis of the spleen is one of the most favorable forms of the disease for treatment and even though the surgeon may expect to find troublesome adhesions in a por tion of the cases he can ordinarily effect a cure by splenectomy

ACUTE SPLENIC ABSCESS

The great majority of splenic abscesses form as a result of breakdown of a septic infarct The patient may already be sick with an obvious infectious process such as ery sipelas phlebitis or typhoid fever or the primary infection may remain occult until the abscess appears as sometimes occurs in early subacute bacterial endocarditis In some infections splenic abscess does not develop until the primary process has begun to re solve This is especially true of acute strepto coccal pharyngeal infections Although the great majority of the lesions are hematog enous lymphatic spread seems to be possible Except in cases of acute pancreatitis it is very rare for splenic abscess to develop through direct extension

In most instances which are secondary to septic embolization multiple abscesses are formed Rarely the spleen may maintain its capsular integrity as the abscesses become confluent to convert the organ into a sac of pus More commonly the spleen eventually ruptures with the sudden release of large amounts of pus into the peritoneal cavity Even when treatment is not instituted it is known that spontaneous resolution and heal ing are possible but because if a surgical specimen does not become available the diag nosis must remain to some extent in doubt the frequency of this course of events is not known That the danger of rupture is great is certain

Clinically a fair variation in acuteness is evident Illness produced by the primary in fectious process may obscure the splenic complication until rupture occurs Usually however the patient suddenly develops pain well localized in the splenic area It is charac teristically aggravated by deep inspiration and by any physical activity The patient prefers to lie supine and very quietly Sys temic response to the suppuration is usually severe with chills high fever marked leuko cytosis and early prostration Examination

reveals striking tenderness and muscle guarding in the left hypochondrium Although the spleen is enlarged this cannot be proved by palpation Percussion which is very painful suggests splenomegaly Perisplenitis ordinarily develops quickly and then there is left upper abdominal muscle spasm and a loud splenic friction rub There may be secondary diaphragmatic pleurisy with a small left pleural effusion Rupture of the abscess is attended by the manifestations of acute abdominal catastrophe nonspecific in their details and not providing diagnostic help if the presence of an abscess has not been suspected The prognosis immediately becomes inexorably grave

Roentgenologic study assists the diagnostic effort to a limited degree Rapid enlargement of the spleen is the important finding and for this reason if there is any suspicion of splenic abscess serial films should be made It is not often possible to outline the organ on a plain abdominal film but because ordinarily there is a degree of adynamic ileus gas in the surrounding bowel helps outline the mass Barium enema examination may seem feasible and then it is found that the area of the splenic flexure is depressed and deformed

Splenectomy as an emergency procedure is the proper treatment Prophylaxis against rupture is the purpose and medical gestures cannot guarantee it Sometimes for instance splenic abscess develops at a time when the patient is being treated for his primary infection with what appears to be an adequate course of antimicrobial drugs It is probable that the antimicrobial drugs have decreased the incidence of complicating splenic abscess and they have no doubt cured some patients The clinician cannot rely on good response to medical treatment however and it has been found that in some patients the antimicrobials prove to be entirely inadequate by themselves The surgical problems of splenectomy under these conditions are many because of adhesions early perisplenic abscess formation and the ease with which the organ ruptures during the manipulations

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CHAPTER 20

GASTROINTESTINAL MANIFESTATIONS OF CERTAIN FAR-REMOVED DISEASES

To anyone who loves clinical gastroenterology observation of the gastroenterologic phenomena which accompany diseases of other systems is one of the most interesting aspects of the whole field Its discussion properly is a discussion of all of medicine surgery obstetrics and in fact all of the specialties and sub specialties Even a brief outline here could go on for many pages To some extent many facets have already been covered In this chapter is gathered a potpourri of those which could not gracefully be fitted in with previous discussions

HEMATOLOGIC DISORDERS

POLYCYTHEMIA VERA

The secondary vascular effects of polycythemia vera (Osler Vaquez disease) may be felt in several areas of the gastrointestinal tract with variable effects The incidence of duodenal ulcer is considerably increased which brings up several interesting etiologic possibilities in connection with the mucosal vasculature its arteriovenous shunts and capillary stagnation

Hepatomegaly is found in about 60 per cent of patients with polycythemia This is explained mainly by the liver s increased blood content but at times cardiac failure or the intervention of leukemia may be responsible Rarely the Budd Chiari syndrome develops but the hepatic veins are among the rarest localizations for spontaneous thrombosis in polycythemia Thrombosis may develop through portions of the portal system leading to portal hypertension and esophageal varices

Generally liver size increases with the passage of time in the patient with polycythemia regardless of the form of treatment Decrease may indicate supervention of Mosse s syn

reveals striking tenderness and muscle guarding in the left hypochondrium Although the spleen is enlarged this cannot be proved by palpation Percussion which is very painful suggests splenomegaly Perisplenitis ordinarily develops quickly and then there is left upper abdominal muscle spasm and a loud splenic friction rub There may be secondary diaphragmatic pleurisy with a small left pleural effusion Rupture of the abscess is attended by the manifestations of acute abdominal catastrophe nonspecific in their details and not providing diagnostic help if the presence of an abscess has not been suspected The prognosis immediately becomes inexorably grave

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utilization is well demonstrated by certain herbivores whose bowel anatomy includes a very long cecum in which bacterial activity is rampant In carnivorous animals on the other hand cul de sac anemia can be produced by simply forming a short blind isoperistaltic loop along the proximal half of the small bowel

Clinically all of the manifestations of pernicious anemia may develop except for permanent achlorhydria which is found in only about half the cases Glossitis and slight icterus are common Subacute combined degeneration of the spinal cord eventually develops in one third of the patients Steatorrhea is *sometimes noted* *Macrocytosis* is a regular feature of the anemia Megaloblast formation is somewhat less striking than it is in pernicious anemia

Vitamin B_1 supplementation furnishes specific therapy Good response follows liver administration too Aureomycin sometimes cures the anemia but the hematologic response is usually suboptimal and of course as theoretically interesting as its relative effectiveness may be this drug is poorly fitted for long term therapy Surgical extirpation of the cul de sac usually cures but often the original bowel disease does not permit it or other considerations may make supplementation more desirable

CARDIOVASCULAR DISEASES

In the case of the cardiovascular diseases gastrointestinal manifestations are sometimes the direct result of secondary gastrointestinal changes but more often they are only mimicking symptoms or simple reflex signs A great many problems are created for the clinician whatever his special interests Anorexia nausea and vomiting are among the most common complaints that the cardiologist must deal with whether the patient has untreated chronic heart failure acute rheumatic fever digitalis intoxication or any one of many other cardiologic diseases

Esophageal varices are common and often severe in chronic congestive heart failure In this condition alone the veins are found to be larger in the midesophagus than they are at the distal end Size and extent fluctuate in rough relation to the severity of failure As when primary hepatic disease is the cause of portal hypertension the incidence of erosive gastritis is high Hemorrhage is not rare creating a problem in blood replacement which is very difficult because of the ease with which pulmonary edema results The diagnostic approach must be vigorous so that the necessary specific therapy can be initiated as quickly as possible This like any other type of gastrointestinal bleeding may for a while give no external evidence of its presence Electrocardiographic changes and the pain of *coronary insufficiency* so often accompany severe bleeding that it is particularly important to do an immediate rectal examination and obtain a rectal stool specimen from all patients suspected of myocardial infarction It is worth remembering that there is a substantially increased incidence of myocardial infarction among patients with duodenal ulcer whether or not there has been hemorrhage

The circulating bilirubin level is elevated to some extent in almost all patients with chronic congestive heart failure When it reaches the point of producing jaundice hemolysis secondary to pulmonary infarction is usually responsible Although severe chronic passive congestion of the liver is a very common autopsy finding it does not often cause jaundice prior to the terminal phase Histologically the liver at first shows centrilobular degeneration and later there are reticular condensation and the other changes of cardiac cirrhosis as discussed in the chapter on the liver After cirrhosis has developed there is relatively high cardiac output at rest with decreased peripheral vascular resistance Although severe cardiac jaundice is usually terminal it may develop rather acutely with severe liver pain early in the course of tricuspid incompetence only to become compensated for gradually as time passes

Of the various cardiac diseases which may simulate acute abdominal conditions one

drome which is cirrhosis which develops in association with polycythemia vera There is no good explanation for the cirrhosis the relative hypoxia of plethora being unsatisfactory because the liver which is normal to begin with shows good resistance to chronic hypoxia *It is possible that cirrhosis is merely* part of the general myelofibrosis of the disease which takes on the special characteristics of cirrhosis in keeping with the liver s usual manner of responding to chronic injury

SICKLE CELL ANEMIA

The best known gastroenterologic manifestations of sickle cell anemia are the tendency to form bilirubin gallstones and the episodic occurrence of abdominal crises The latter represent the visceral manifestations of the disease s general hemolytic and intracapillary stagnation process It is in addition a dangerous complication of steroid hormone therapy in patients with sicklemia A quickly fatal outcome particularly in small children is not unusual The main clinical feature is sudden onset of abdominal pain vomiting and chills Examination reveals abdominal tenderness and variable rigidity hepatomegaly splenomegaly fever rapidly changing neurologic abnormalities and often sudden shock There is leukocytosis and hyperbilirubinemia and the serum amylase and lipase levels may be elevated At autopsy there are congestive and degenerative changes in the capillaries and venules of the brain fragmentation of the myocardium congestion of the liver and spleen and often thrombotic erosions through the bowel

The less spectacular gastrointestinal manifestations are for the most part limited to the liver Liver damage of subclinical degree is common in this disease There may be hemosiderosis if the course has necessitated multiple transfusions It is not unusual to observe what appears clinically to be simple virus hepatitis in the sickle cell anemia patient only to find upon liver biopsy that there is central lobular necrosis and agglutination thrombi throughout the portal capillaries without the characteristic changes of hepatitis The clinical course is likely to be very much like that of simple hepatitis but recurrence is much more likely Cirrhosis can probably be considered a common sequel of this process although the over all incidence *of cirrhosis in sickle cell anemia does not* seem to be especially high

CUL DE SAC ANEMIA

Megaloblastic anemia with any of the clinical findings of pernicious anemia may develop in patients who have had some surgical procedure which has left behind a blind segment of bowel The operation might have been done to short circuit a stretch of ileitis or a stricture or the closed end of the afferent segment of a poorly chosen side to side enteroenterostomy may have enlarged as a diverticular cul de sac There is some suggestion that simple acquired diverticula of the upper half of the gastrointestinal tract may rarely be causally associated with megaloblastic anemia and that chronic bowel stenosis alone may possibly play such a role but it is probable that pernicious anemia susceptibility must exist in such patients For the most part if cul de sac anemia is to develop the blind loop must be connected to the upper part of the small intestine

The common factor in this form of anemia is stagnation of bowel contents in a cul de sac Clinically and hematologically the problem appears to be clear cut vitamin B_{12} deficiency Eradication of the blind segment usually cures the anemia and it is consequently believed that the deficiency is secondary to abnormal bacterial activity within it Vitamin B_{12} can be synthesized by certain types of bacteria and molds but the intestinal bacteria of carnivorous animals are not able to carry this out necessitating adequate ingestion of vitamin B_{12} to meet all normal needs If an additional demand is placed on the supply through excess bacterial utilization deficiency anemia may result The mechanism therefore is like that of fish tapeworm anemia The importance of bacterial types in controlling excess vitamin B_{12}

etiology presumably viral without serologic associations with influenza The patient previously well awakes in the morning with severe vomiting Sometimes there is severe but brief collapse Complete recovery follows spontaneously in one or two days

OBSTETRIC AND GYNECOLOGIC CONDITIONS AND DISORDERS

Women virgin and pregnant have a great many gastrointestinal problems which are peculiar to their reproductive activities These cover a wide spectrum from the acute abdominal pain of the mittelschmerz to the homely constipation and hemorrhoids of late pregnancy

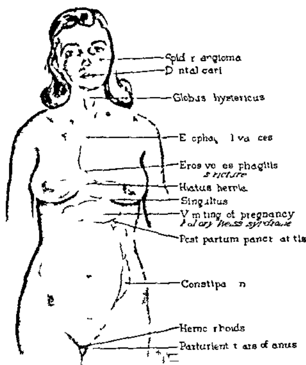


Fig 215 The common gastrointestinal complications of pregnancy

SPECIAL PROBLEMS OF PREGNANCY

Morning sickness and constipation are so common during pregnancy that women accept them as physiologic variants and have developed their own devices for helping themselves The constipation however aggravates the natural tendency for hemorrhoid formation and the vomiting may in rare instances prove dangerous by initiating gastric hemorrhage through the Mallory Weiss mechanism In cases of pernicious vomiting the danger of bleeding is much greater even though at that its incidence is very low Although important mainly because of the nuisance they create morning sickness and constipation had best be taken seriously by all concerned

At least two thirds of normal pregnant women develop esophageal varices during the second half of pregnancy The distal two thirds of the esophagus is usually involved and although there are wide variations the varices may measure up to 8 mm in diameter They are then of considerable size and extent It is thought that the hypervolemia of pregnancy plus the mechanical derangements produced by the enlarging uterus is the explanation The varices disappear within two weeks after delivery The many protective mechanisms with which Nature endows the

must be particularly alert to the possibility of acute pericarditis This is not to detract from the importance of myocardial infarction in this connection but the presence of pericarditis is more likely to remain occult Sometimes when massive pericardial effusion collects an epigastric bulging which may superficially suggest the presence of some abdominal disease develops (Auenbrugger s sign) Following myocardial infarction the left leaf of the diaphragm is frequently elevated by the collection of gas in the stomach and colon (Laubry Soulle syndrome) sometimes simulating localized subphrenic peritonitis

A good many important organic gastrointestinal diseases are due to local vascular defects Some of the responsible processes are generalized ones and a portion of these first manifest themselves through the gastrointestinal tract Thus periarteritis nodosa may cause disease which seems to be primary in the rectum gallbladder liver small intestine or appendix Acute abdominal surgical emergencies may develop as the first evidence of periarteritis nodosa as a result of infarction and perforation of a viscus bowel obstruction or intraperitoneal hemorrhage The little strokes of Alvarez often cause gastrointestinal symptoms especially dysphagia and shooting abdominal pains

The vascular manifestations of a few diseases which are not primarily vascular may at times lead to important gastrointestinal manifestations Elastica disease is an example This familial dermatologic entity is characterized by cutaneous papule formation and absence of cutaneous elasticity Various visceral areas are affected by the basic abnormality of the elastic fibers Massive gastrointestinal hemorrhage sometimes results from degeneration of the elastica of the visceral arteries with formation of submucosal microaneurysms throughout the small intestine

It is important to remember whenever transoral manipulations are carried out that in some people the esophagocardiac reflexes are tuned up to a degree of remarkable sensitivity In fact on rare occasions one encounters a person in whom the mere act of normal swallowing initiates an attack of atrial tachycardia or some other arrhythmia The degree of disability felt by such people is very great In an occasional patient who has shown no such abnormal sensitivity passage of a tube into the esophagus sets off the esophagocardiac reflex with production of some dangerous arrhythmia Distention of the esophagus as well as of the stomach gall bladder common duct and other organs diminishes coronary blood flow in experimental animals but the arrhythmias encountered during peroral intubation are probably on a simple reflex basis

INFECTIOUS DISEASES

In addition to the infectious diseases which affect specific visceral organs in specific ways the systemic effects of any generalized infection may cause important gastrointestinal damage Sometimes this takes the form of reversible acute hepatocellular injury but it is unusual to detect it unless there is death and the liver is examined at autopsy More often it is the mucosa of the hollow viscera which is damaged leading to extensive erosive disease and at times to important bleeding This is a hematogenous affair the noxious influence reaching the mucosa from the general circulation Although specific infectious agents do not often affect the stomach directly the hematogenous toxic products of bacterial activity frequently produce an acute hematogenous gastritis This is the gastritis sympathica acuta of Ewald The same process may develop through the upper part of the small intestine It is to be regarded as part of the general intoxication of the organism

During the prodromal period of measles the wall of the appendix and of certain other organs is the seat of an intense lymphoid reaction which includes multinucleated cells and a type of giant cell pathognomonic of measles The alert pathologist may at times predict the clinical arrival of measles by examining a surgically amputated appendix

Hyperemesis hiemalis (winter vomiting disease) is an epidemic disease of unproved

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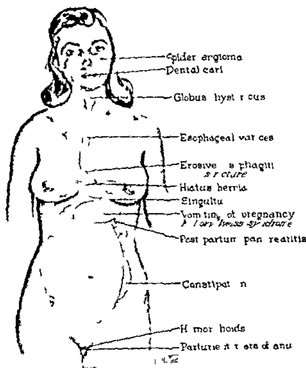


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pregnant woman seem to include some device to insure variceal integrity for hemorrhage of variceal origin is very rare

Although as a rule duodenal and gastric ulcers which exist prior to conception heal rapidly during pregnancy this does not invariably happen In an occasional woman an ulcer appears for the first time during pregnancy and rarely it enlarges rapidly up to the time of delivery In spite of objections to roentgenologic study during pregnancy it may be necessary to confirm the clinical impression of ulcer in some cases Parenthetically in thinking of ulcer etiology one should note that gastric secretory activity is not depressed during pregnancy in spite of the usual salubrious effect of pregnancy on ulcer

Acute pancreatitis sometimes develops in young women a few days or weeks after the natural termination of pregnancy There is question whether this can properly be considered a complication of pregnancy although postpartum pancreatitis is sometimes spoken of as a clinical grouping

ESOPHAGITIS AND HIATUS HERNIA OF PREGNANCY

The most important sequel of pregnancy as far as the gastrointestinal tract is concerned is subacute erosive esophagitis Its importance lies in the strictures it may produce and to a lesser extent in the bleeding it may cause Approximately 10 per cent of pregnant women complain of difficult or painful swallowing at some time prior to delivery or during the first few postpartum weeks Globus hystericus is the most common explanation and it behaves under these circumstances just as it does when there is no pregnancy In some of the other patients it is found that there is no true dysphagia or odynophagia but that the difficult swallowing is actually an abdominal sensation of fullness or inability to eat very much The rest of the patients about 1 or 2 per cent of all pregnant women have symptomatic esophagitis

Esophagitis of pregnancy is not necessarily related to vomiting and very severe cases may develop in women who have no morning sickness at all The symptoms are those which have already been related in the chapter on esophageal diseases Simple pain on swallowing is most commonly observed It may be very severe but ordinarily is not It may fluctuate remarkably from day to day Often there is pyrosis too Hematemesis of mild or moderate degree is not rare and when the patient is examined esophagoscopically during active hemorrhage it is found that a great number of erosions scattered through the mucosa of the distal one third or half of the organ are bleeding actively

Stricture formation is a very rapid process in a small proportion of pregnant women As in stricturing under other circumstances the distal portion of the organ is usually affected At the time it first comes to someone s attention it may already have produced almost complete occlusion of the lumen The lesion sometimes causes obstructive symptoms before the third trimester is very far along Usually however it does not make itself known until just before or just after delivery and occasionally circumstances suggest that a stricture which develops many months after pregnancy has passed is secondary to the esophagitis of pregnancy

As an interesting associated circumstance but probably not a factor in the etiology of the esophagitis hiatus hernia becomes very common during the latter half of pregnancy The enlarging uterus always produces major mechanical changes in the upper abdomen including elevation and rotation of the stomach and disassociation of the normal relationships between the cardia and diaphragm The majority of hiatus hernias which develop during pregnancy are simple direct hernias and they have a unique temporary existence Because of the obstetrician s reticence to permit any amount of roentgen study during pregnancy it is difficult to draw specific conclusions in individual cases Esophagoscopic observations however have shown that hiatus hernias which are easily demonstrated during pregnancy often cannot be found following the puerperium Most of the hernias are quite small the esophagogastric junction lying usu

ally about 3 cm above the hiatus. Very large hernias may of course be encountered but these for the most part probably represent lesions which had existed prior to pregnancy Occasionally such a hernia becomes acutely strangulated during labor

Treatment of the esophagitis of pregnancy is based on the same principles as those which apply under other circumstances Most help comes from the natural termination of pregnancy In instances of hemorrhage from esophagitis pneumatic tamponade with the *Sengstaken tube affords good control* Development of stricture necessitates bouginage preferably with Hurst mercury bougies if treatment must be begun before delivery

RUPTURED ECTOPIC PREGNANCY

Ruptured ectopic pregnancy is one of the more important possibilities to be considered in approaching young women with acute abdominal pain Because obstetricians are not likely to see the patients until someone else *has suspected the diagnosis*, the gastroenterologist must assume active responsibility for this disease

Tubal pregnancy usually develops in women who have a history of pelvic inflammatory disease previous ectopic pregnancy spontaneous abortions or a long period of sterility prior to the present conception It is much more common in Negroes than Caucasians Abdominal pregnancy is usually secondary to tubal pregnancy

Vaginal spotting plus abdominal pain in a pregnant woman or one who has skipped a period or two suggests the possibility of ruptured ectopic pregnancy One of two processes may be going on within the pelvis sudden profuse hemorrhage into the peritoneal cavity or slow bleeding for several hours or days which is then followed by profuse hemorrhage The apparent seriousness of the immediate clinical picture depends on the acuteness of rupture Sudden pain of abdominal origin which leads to syncope in the female is most often due to ruptured ectopic pregnancy The pain has a tearing quality and sometimes is felt throughout the abdomen with referral to the left shoulder When localized in the hypogastrium it may be most severe on the side opposite the rupture If bleeding is slow there may be intense cramping at the start Later ileus and distention develop Nausea and vomiting are the most prominent subjective features in a minority of the patients Irritation of the lower urinary tract leads to severe dysuria and inability to empty the bladder

Examination shows no fever whenever there is significant fever at the start of abdominal pain in a woman it is a good rule to look first into pulmonary or kidney disease for the cause There may have been shock from the time of rupture and occasionally all of the signs of acute blood loss are found A *variable degree of tenderness* may be present in the hypogastrium but its localization is not especially helpful for deciding its cause Irritation confined to the peritoneum of the pelvis does not produce abdominal wall rigidity Usually pelvic examination reveals a mass The affected tube lies anteriorly in contrast to the posterior position of a pyosalpinx The cul-de-sac is infringed upon by a doughy fullness.



FIG 216 Culdoscopic view of tubal pregnancy

The most useful diagnostic procedure for ectopic pregnancy is culdoscopy both before and after rupture has occurred (Fig 216) Treatment consists of immediate surgical extirpation of the affected tube removal of the

products of conception and toilet of the peritoneum

TWISTED OVARIAN CYST

Early in the course of this disease it is usually clear that the problem lies in the pelvic viscera but at times there is close simulation of acute appendicitis and later the picture may simulate that of any of several acute abdominal diseases Torsion is usually induced by some unusual exertion or trauma It may be only partial and recurrent or it may be complete In the latter instance there is sudden agonizing pain well localized to the affected area There is often primary shock An extremely tender mass can usually be found on pelvic examination Abdominal findings are likely to be less definite with rather diffuse tenderness and peritoneal signs referred to the lower part of the abdomen As gangrene develops the manifestations become more generalized with universal abdominal rigidity fever leukocytosis tachycardia and collapse There may be vaginal bleeding a sign of great diagnostic importance Often the diagnosis is not made until the abdomen is opened but the need for emergency surgery is usually apparent

THE CORPUS LUTEUM AND HEMOPERITONEUM

Rupture of an apparently normal corpus luteum is not a rare cause of hemoperitoneum In most cases it occurs between the eighteenth and twenty fourth day of the menstrual cycle The general clinical picture is rarely frightening Abdominal pain which is usually confined to the hypogastrium develops suddenly but does not progress Mild backache is often associated with it There is nausea and occasionally vomiting Upon examination hypogastric tenderness is regularly found

For the most part this condition is discovered only if the clinical picture simulates an acute surgical disease and exploratory operation is done No treatment is necessary but this raises important problems in the general management of abdominal pain Corpus luteum rupture is poorly known as compared with the mittelschmerz of follicle rupture but however well it might be popularized one supposes that it will still be necessary to explore a good portion of patients who present themselves with hemoperitoneum or any other picture of sudden abdominal pain The bleeding itself is usually not important but the danger of overlooking a ruptured ectopic pregnancy is The main point is that the clinician recognize the possibilities of this and similar quasi physiologic mechanisms in the production of abdominal pain

MEIGS SYNDROME

Because ascites is often its main subjective manifestation women with Meigs syndrome sometimes consult a gastroenterologist first The primary disease process is benign ovarian tumor—fibroma as the syndrome was initially thought of but any benign solid type which is accompanied by the other manifestations as the syndrome is now defined In addition to ascites and ovarian tumor there is pleural effusion usually on the right side sometimes on the left often on both The fluid is a clear transudate Although many types of neoplasm of the ovary or elsewhere may produce a similar fluid response the strange feature here is that the tumor is benign It is solid too there being involved no cyst rupture or process similar to pseudomyxoma peritonaei The full syndrome occurs in only about 1 per cent of all cases of ovarian fibroma and it tends to develop only after the tumor has attained large size The tumor is often palpable upon abdominal examination in spite of the ascites

Meigs syndrome is by definition a benign one The important consideration is that by recognizing its existence the clinician not immediately assume malignancy when he finds abdominal tumor associated with ascites in a woman Extirpation of the tumor cures all manifestations

UROLOGIC DISEASES

One s urologic colleagues are likely to say that urologic disease is responsible for more gastrointestinal symptoms than is gastrointestinal disease This is an exaggeration but

it is a useful warning The gastrointestinal manifestations of urologic diseases are truly legion and they are notorious for the diagnostic confusion they may create Urinary calculus furnishes a good example in 15 per cent of cases the only symptom is epigastric pain about 5 per cent are treated by appendectomy because of mistaken diagnosis and 20 per cent are diagnosed initially as either cholecystitis or duodenal ulcer Approximately two thirds of patients with renal tumors have gastrointestinal symptoms as their presenting complaints Various bowel dyskinesias secondary to autonomic reflexes appear to be responsible although when the kidney pelvis is distended in experimental animals the only obvious response is pylorospasm During cystoscopy it can be shown that ureteral distention may cause pylorospasm without producing ureteral pain Referral of renal pain to the upper anterior abdomen is particularly common in children Disease of the seminal vesicles often causes pain in the cecal area as does acute epididymitis Rectal complaints are less prominent than those referred to the upper gastrointestinal tract but they are not rare

ANOREXIA NERVOSA

Anorexia nervosa is a major psychiatric disease and the gastroenterologist by himself cannot often make a concrete contribution to the patient Perhaps his most important responsibility is to see to it that the patient is placed in interested psychotherapeutic hands as soon as the condition is recognized It is especially important that he be sure that no one presents diet or drug therapy as important to the problem s solution

Anorexia nervosa is a complex emotional disease with various secondary endocrine changes About eight women are affected to one man In three quarters of the cases the age at which severe underweight is attained lies between 15 and 30 years The total picture is that of an immature and colorless personality with poorly integrated emotions The patient s thinking is superficial and unimaginative He is socially retiring constantly fatigued fearful and easily upset He hates sex this being as constant a feature as any He repudiates his sexuality There is unusual sensitivity and this leads to easy discouragement in spite of a characteristically high level of intelligence and general ability Often the patient tells of a nervous and ineffective father and it soon becomes clear that the patient is just as submissive himself usually under the thumb of an arrogant complaining domineering mother

The endocrinologic features which are entirely secondary to the emotional and starvation factors are variable and probably quite complex The functional activity of the pituitary is greatly impaired by starvation Structural changes in the anterior lobe however are absent or only slight as compared with those observed in primary hypopituitary cachexia First there is decrease in the activity of the gonads and thyroid Early in the course of the disease half of the women patients have amenorrhea and later on there is almost always amenorrhea The basal metabolic rate blood pressure and 17 ketosteroid excretion are depressed although the protein bound iodine and I^{131} uptake are normal Adrenocortical activity is maintained for a longer period than that of the ovaries and thyroid The functional hypopituitarism of anorexia nervosa is reversed if starvation is overcome

The obvious clinical manifestations are of course refusal to eat and consequent loss of weight The degree of underweight regularly becomes severe The patient protects himself after his weight has fallen to a very low level and it is most unusual for the patient actually to starve himself to death The self imposed starvation of anorexia nervosa has two interesting characteristics the incidence of secondary infections and of other indications of decreased resistance is lower than might be expected and clinical evidences of specific dietary deficiencies are not common In an occasional patient there are prominent hyperhidrosis and paresthesias (Gopalan s syndrome) Constipation sometimes leading to megacolon is moderately common

Because this is consciously or unconsciously a self inflicted disease it is not surprising to find that the patient usually has few or no complaints at all Quite regularly the patient s family or friends are responsible for his problem s having been brought to medical attention Various devices particularly vomiting are often used however to emphasize the patient s plight to others and perhaps to make things inconvenient for others As a rule the patient acts as thought he is entirely content with things and in fact does not want anything to be changed Resistance to all forms of therapy and proffered help is the result and a very characteristic feature it is Throughout the course of illness one can always note that the patient s marasmic state is of much more concern to others—the patient s family friends nurses doctors and other patients—than it is to himself

Treatment is a difficult problem for the psychiatrist because of this patient resistance Very little can be done for the patient by the gastroenterologist until some psychiatric progress has been made The whole problem is to induce the patient to want to eat and if this is accepted through genuine emotional response the problem is largely solved Unfortunately response comes slowly if it comes at all The organic need is for a normal food intake normally eaten Often the patient tries to deceive those interested in him by only pretending to eat and then *complaining that he is* not able to gain weight A 90 lb patient will gain weight rapidly on a 3000 calorie diet and if he does not he is not eating his food Even while under hospital surveillance some patients will go to considerable lengths to dispose of their food secretly in places other than their stomach Tube feeding usually proves to be a mistake both because it is interpreted by the patient as a punitive measure and because he can be counted on to find a way to foil this attempt to make him better usually by vomiting In a rare case the psychiatrist may recommend prefrontal lobotomy

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INDEX

Whenever feasible items have been arranged according to organ and region

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